US008922490B2

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Davidson et al.

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(45) **Date of Patent: Dec. 30, 2014**

(54) **DEVICE, METHOD, AND GRAPHICAL USER INTERFACE FOR ENTERING ALTERNATE CHARACTERS WITH A PHYSICAL KEYBOARD**

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(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 615 days.

(21) Appl. No.: **13/243,733**

(22) Filed: **Sep. 23, 2011**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 61/493,351, filed on Jun. 3, 2011.

(51) **Int. Cl.**
G06F 3/02 (2006.01)
G06F 3/0489 (2013.01)

(52) **U.S. Cl.**
CPC ***G06F 3/04895*** (2013.01)
USPC **345/168**

(58) **Field of Classification Search**
CPC ... G06F 3/0233; G06F 3/0234; G06F 3/0235; G06F 3/0236; G06F 3/0237; G06F 3/04895
USPC 345/168–172
See application file for complete search history.

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Primary Examiner — Dmitriy Bolotin
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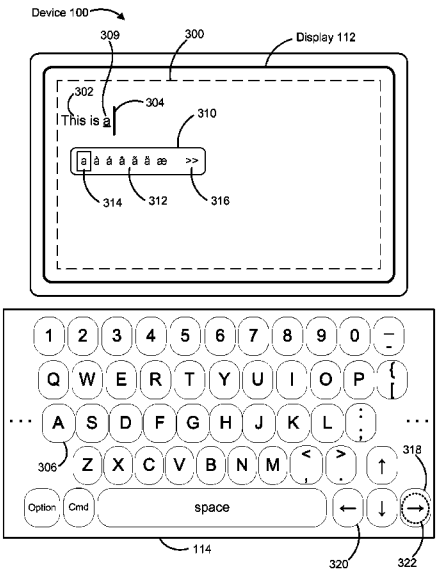
(57) **ABSTRACT**

A device displays a text entry area with an insertion point and detects activation of a first physical key in a physical keyboard. In response to a determination that the activation of the first physical key lasts more than a first predefined time period, the device displays a character selection area; while displaying the character selection area, the device detects activation of a second physical key in the physical keyboard; in response to a determination that the activated second physical key is an arrow key, the device moves a current character focus in accordance with a direction of the arrow key; and, in response to a determination that the activated second physical key is the first physical key, the device enters in the text entry area a single instance of a character that has the current character focus, and ceases to display the character selection area.

20 Claims, 23 Drawing Sheets



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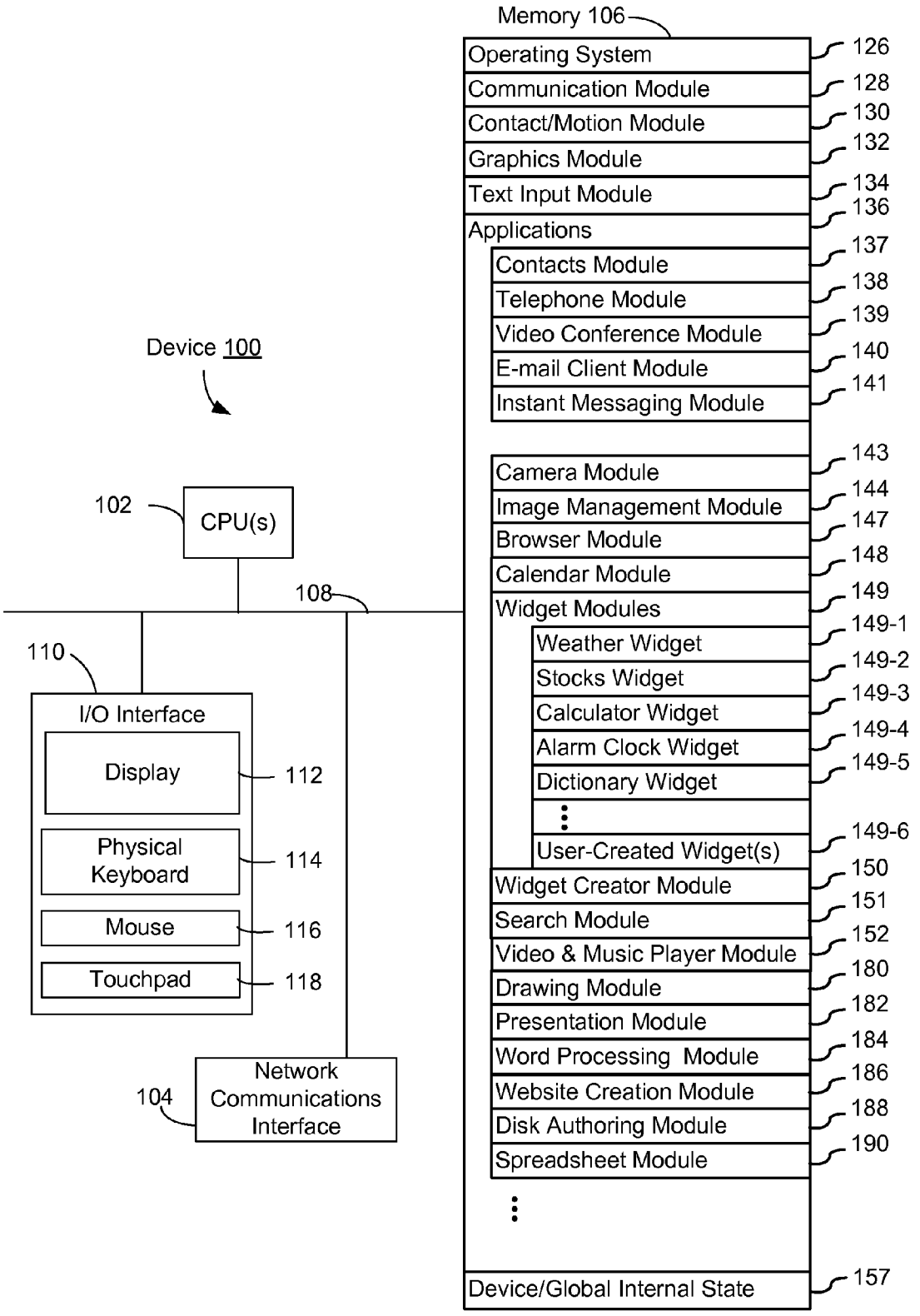

Memory 106
Operating System
126
Communication Module
128
Contact/Motion Module
130
Graphics Module
132
Text Input Module
134
Applications
136
Contacts Module
137
Telephone Module
138
Video Conference Module
139
E-mail Client Module
140
Instant Messaging Module
141
Camera Module
143
Image Management Module
144
Browser Module
147
Calendar Module
148
Widget Modules
149
Weather Widget
149-1
Stocks Widget
149-2
Calculator Widget
149-3
Alarm Clock Widget
149-4
Dictionary Widget
149-5
User-Created Widget(s)
149-6
Widget Creator Module
150
Search Module
151
Video & Music Player Module
152
Drawing Module
180
Presentation Module
182
Word Processing Module
184
Website Creation Module
186
Disk Authoring Module
188
Spreadsheet Module
190
Device/Global Internal State
157
Device 100
102
CPU(s)
108
110
I/O Interface
Display
112
Physical Keyboard
114
Mouse
116
Touchpad
118
Network Communications Interface
104

Figure 1

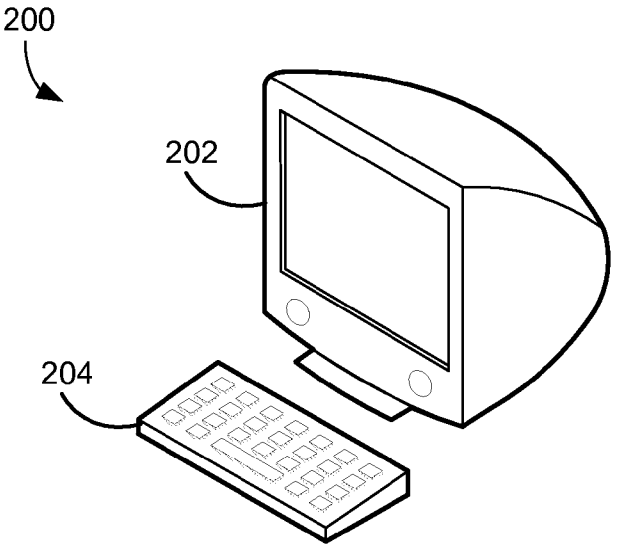


Figure 2A

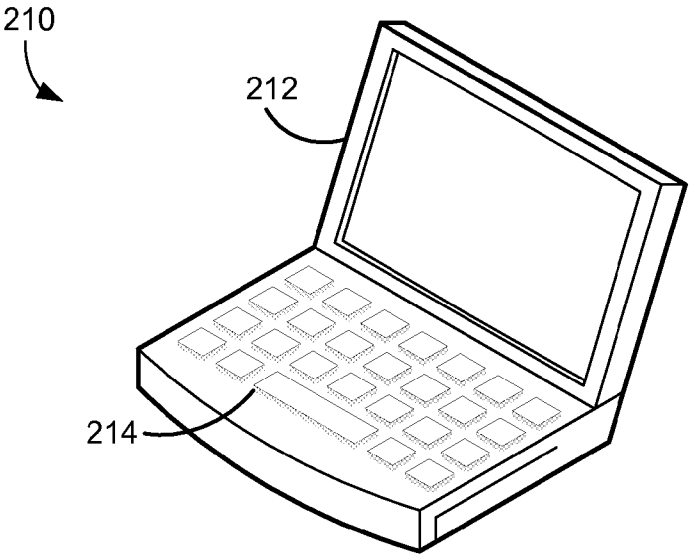
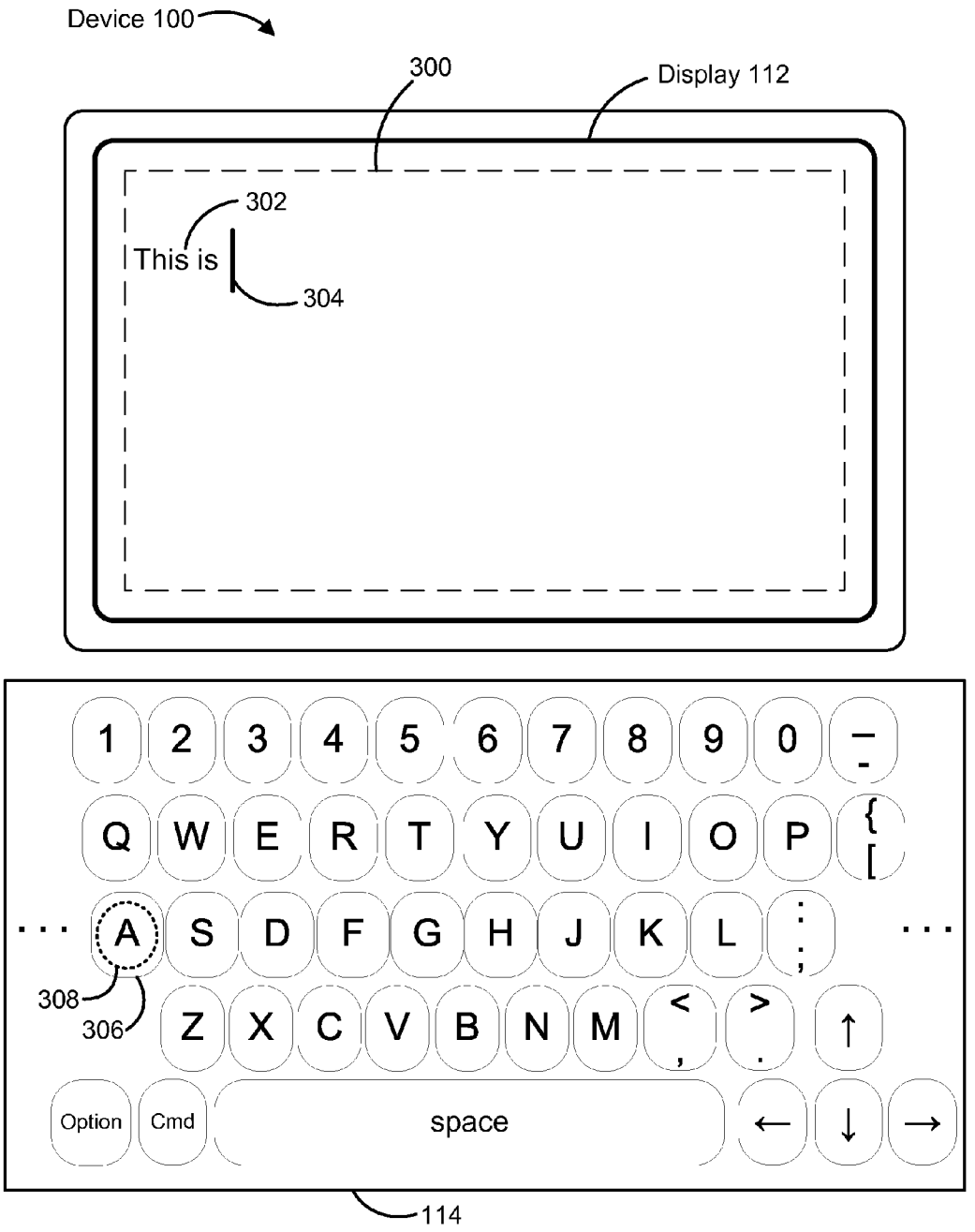


Figure 2B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Display 112
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This is
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1 2 3 4 5 6 7 8 9 0 - =
Q W E R T Y U I O P { [
A S D F G H J K L : ;
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Z X C V B N M < , > . ↑
Option Cmd space ← ↓ →
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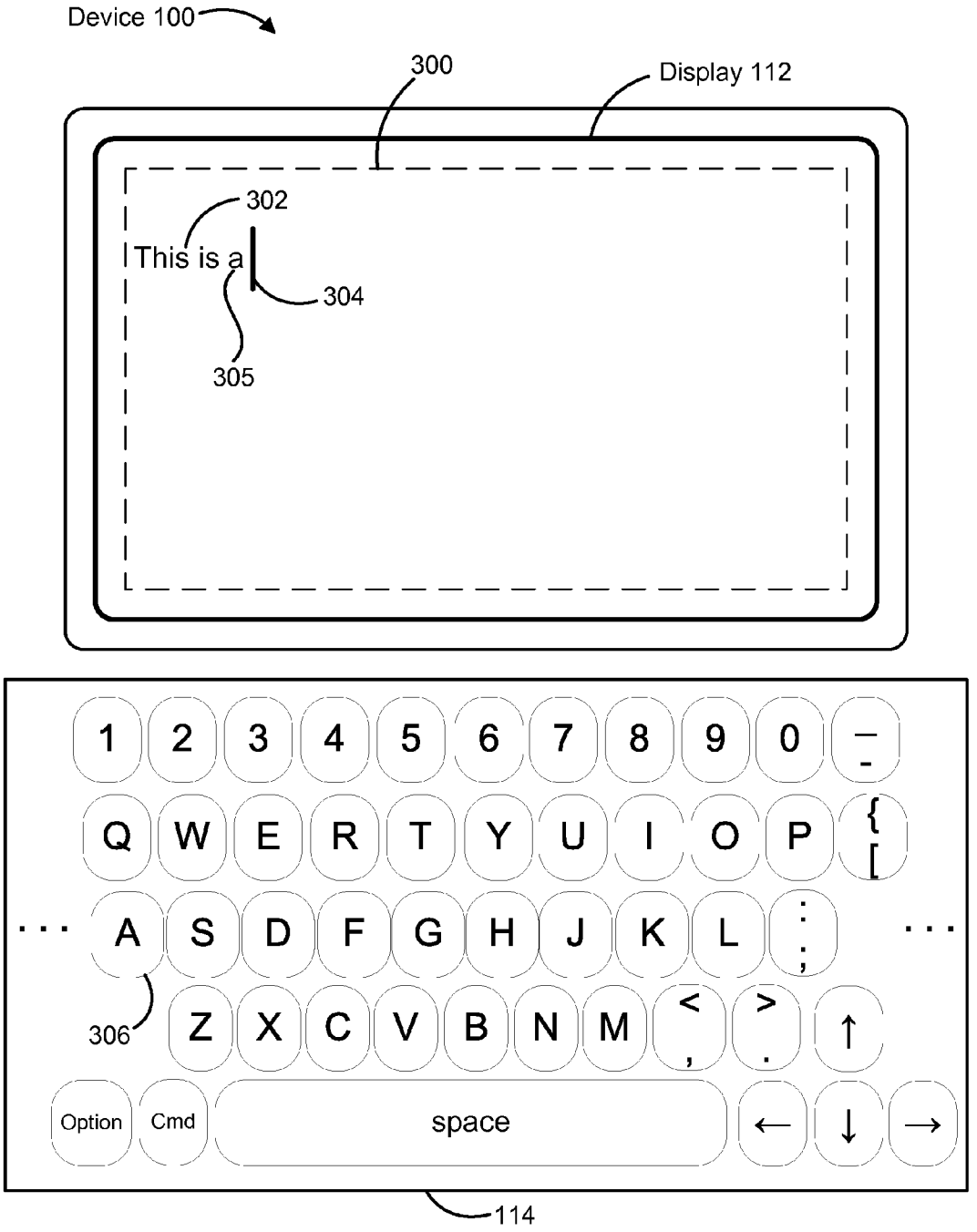
Figure 3A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Option Cmd space ← ↓ →
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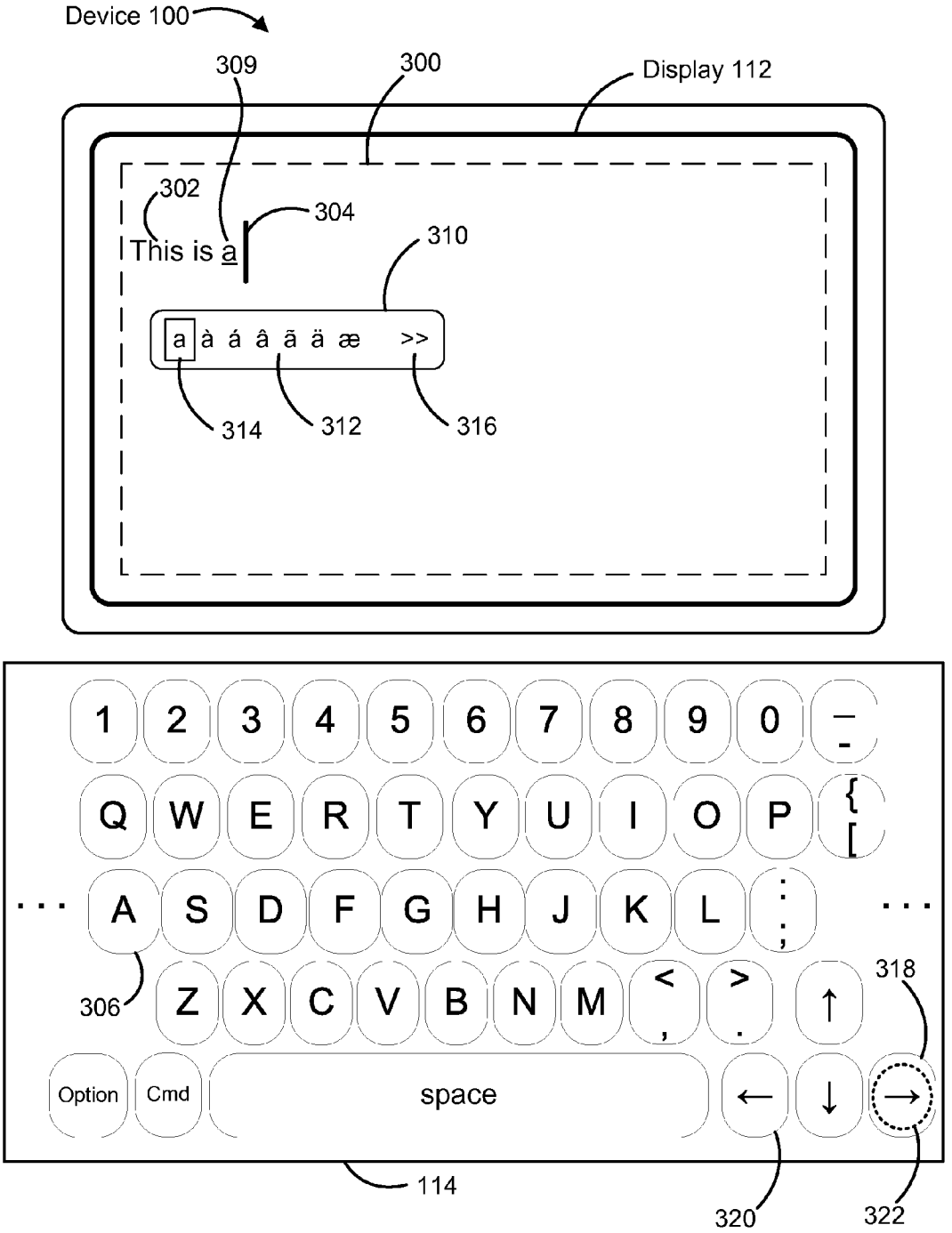
Figure 3B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Option Cmd space
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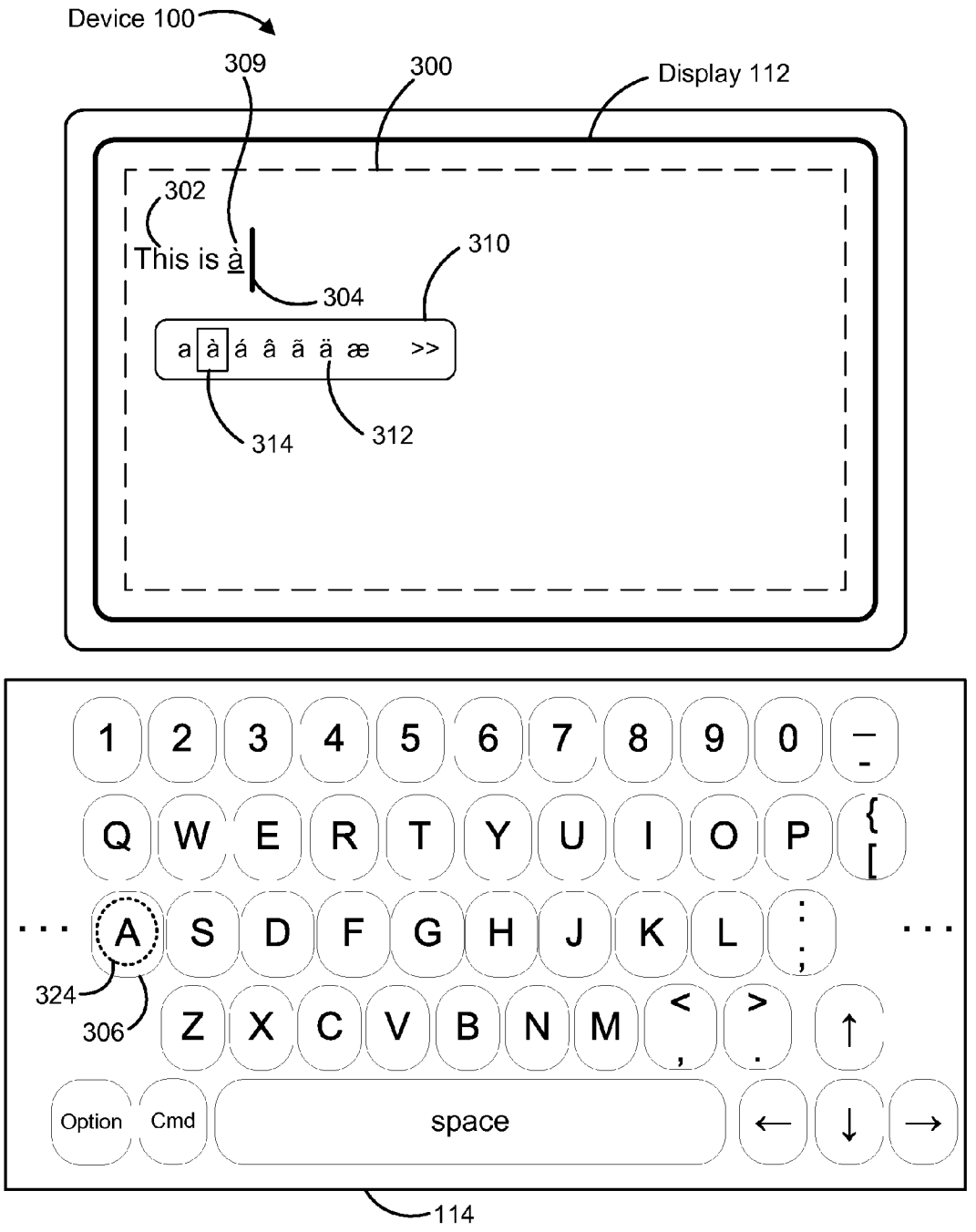
Figure 3C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Z X C V B N M
Option Cmd space
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306
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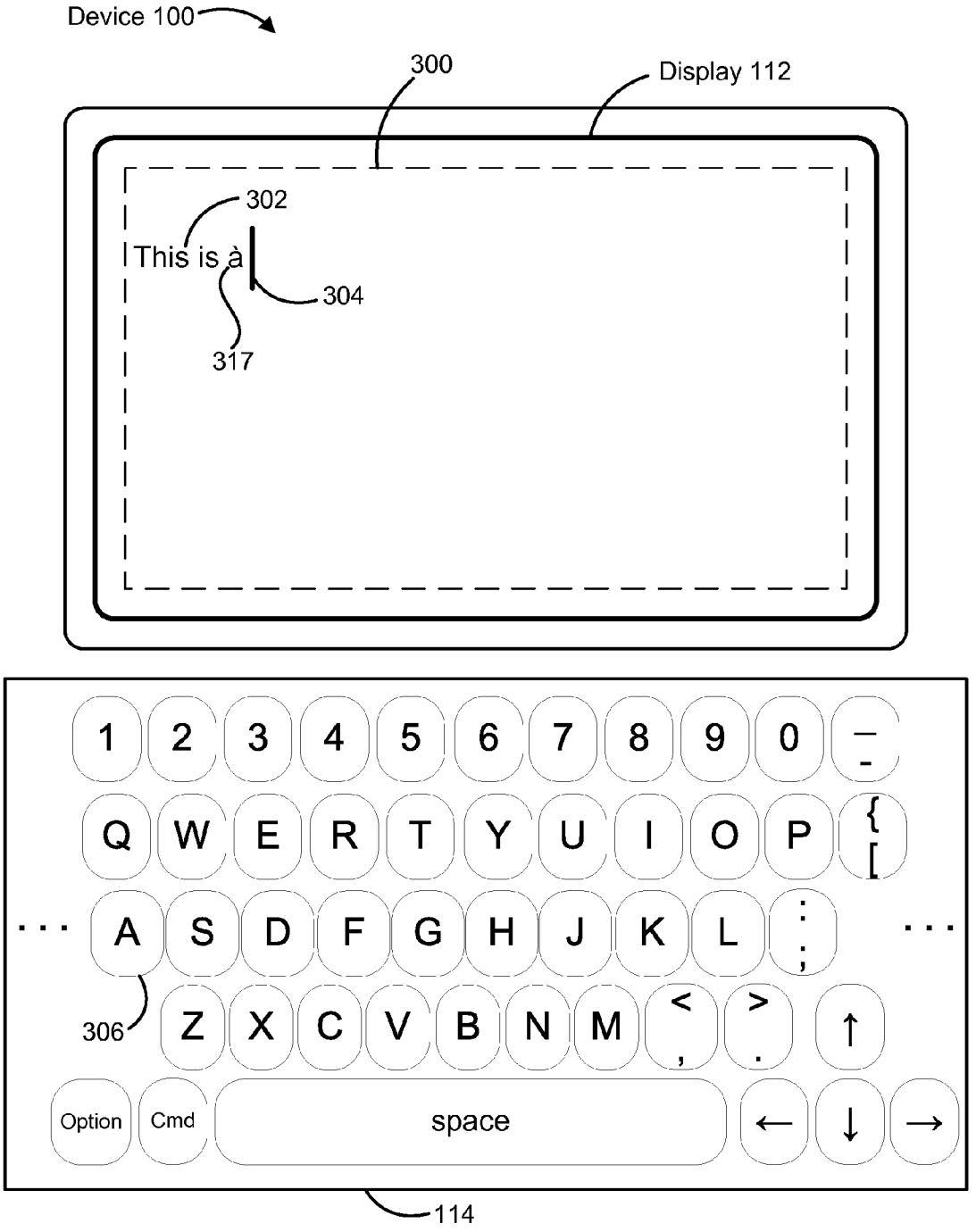
Figure 3D


Device 100
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Option Cmd space ← ↓ →
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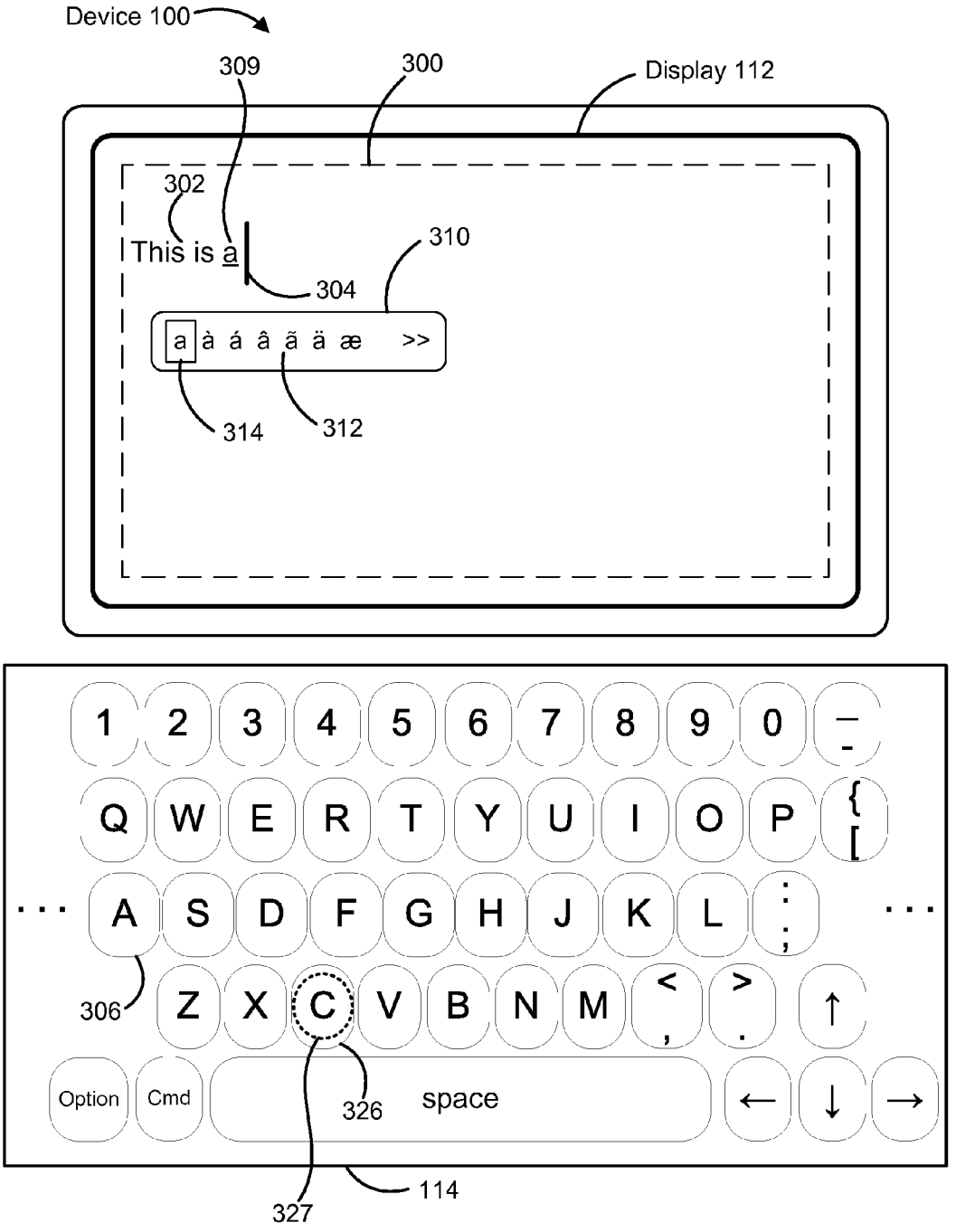
Figure 3E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327
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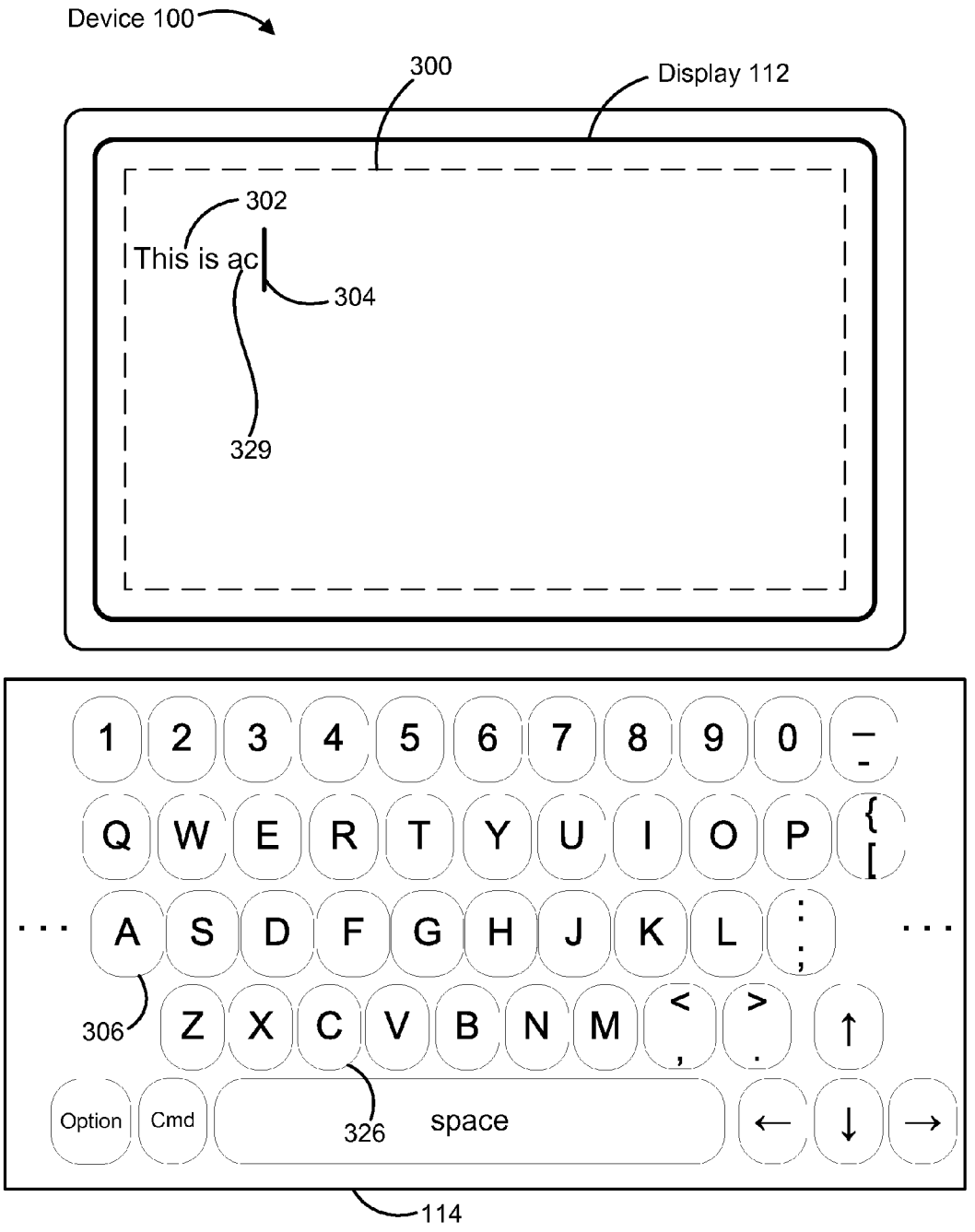
Figure 3F


Device 100
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1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
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Z X C V B N M
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Option Cmd space
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Figure 3G

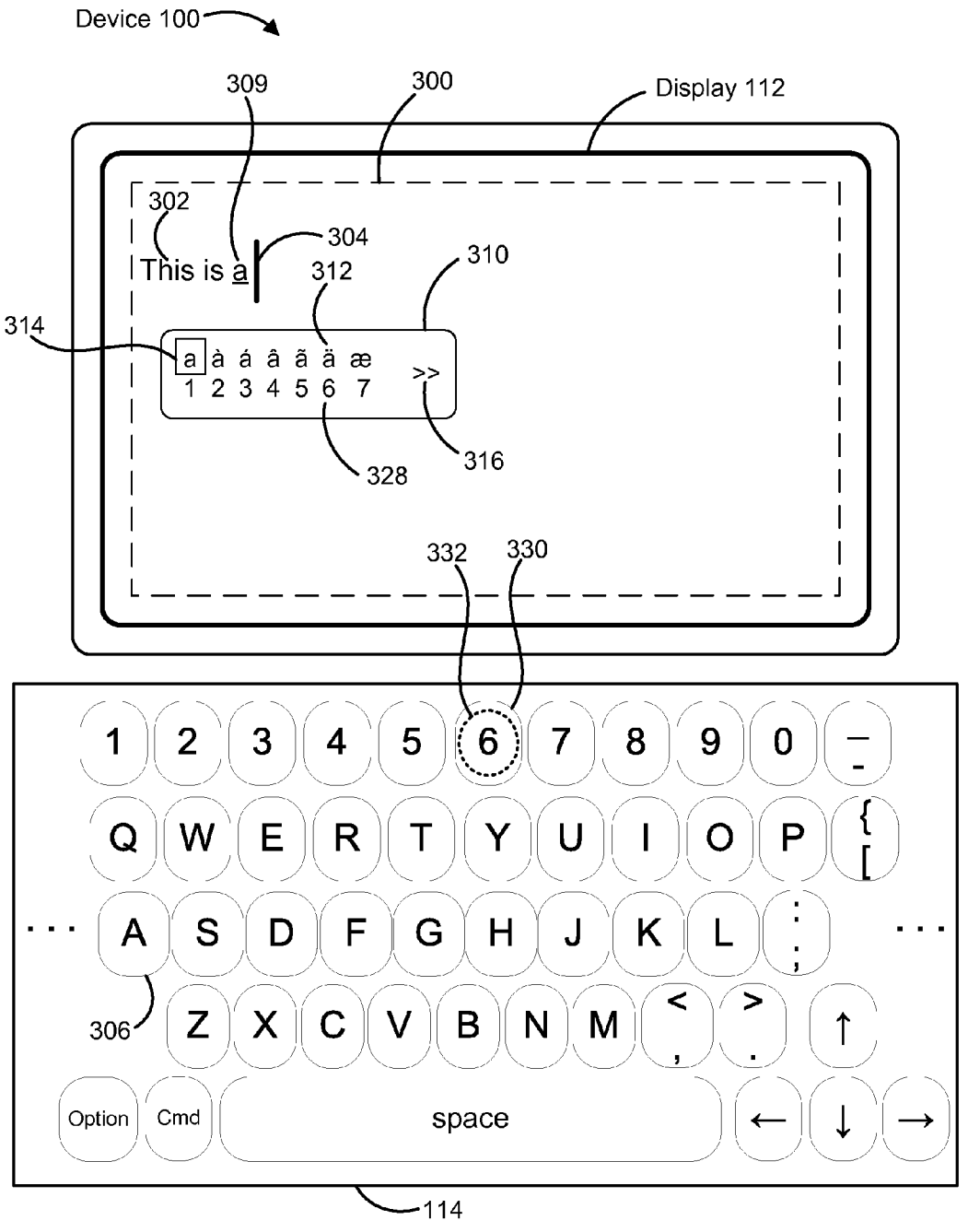
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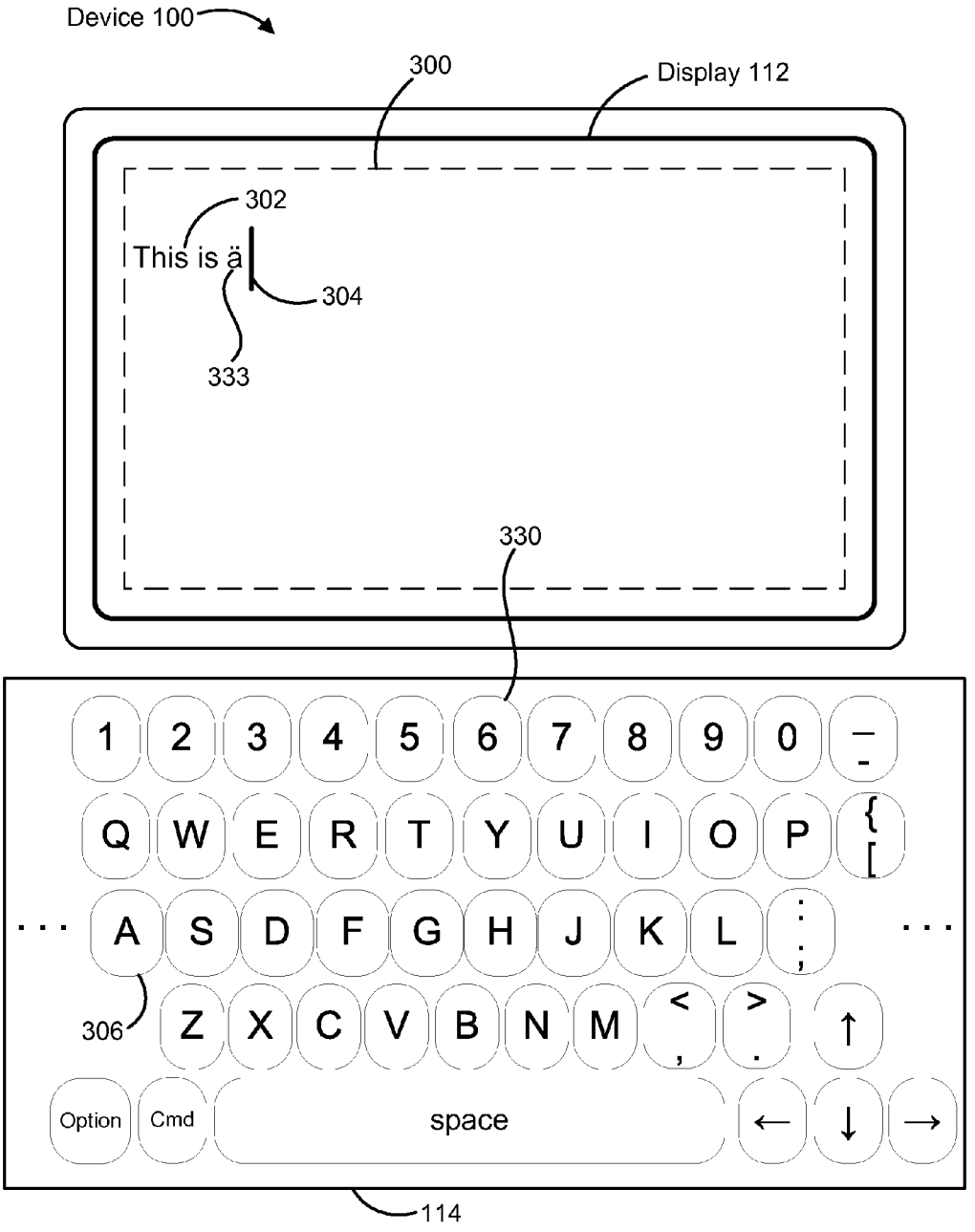
Figure 3H


Device 100
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Option Cmd space ← ↓ →
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Figure 3I

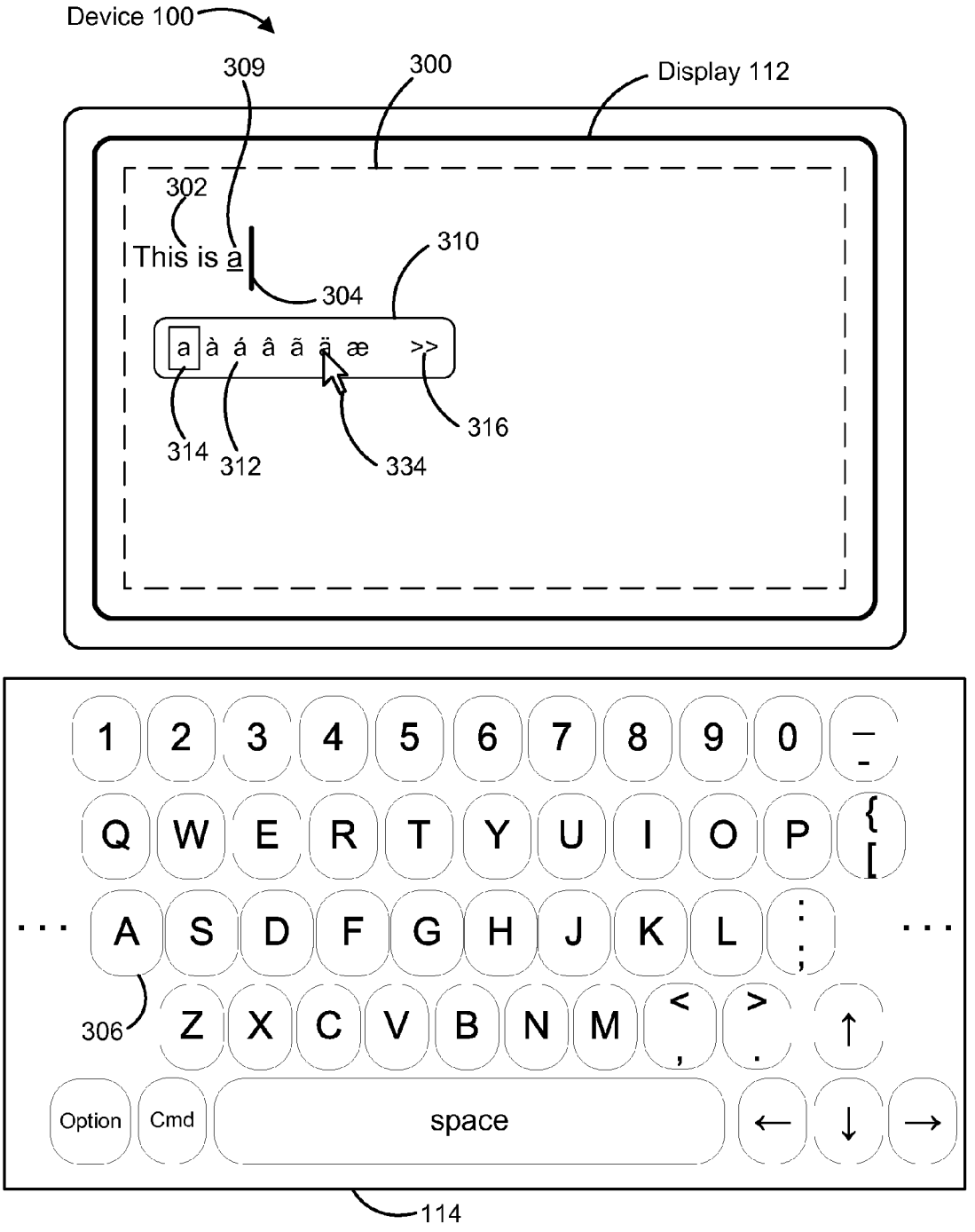
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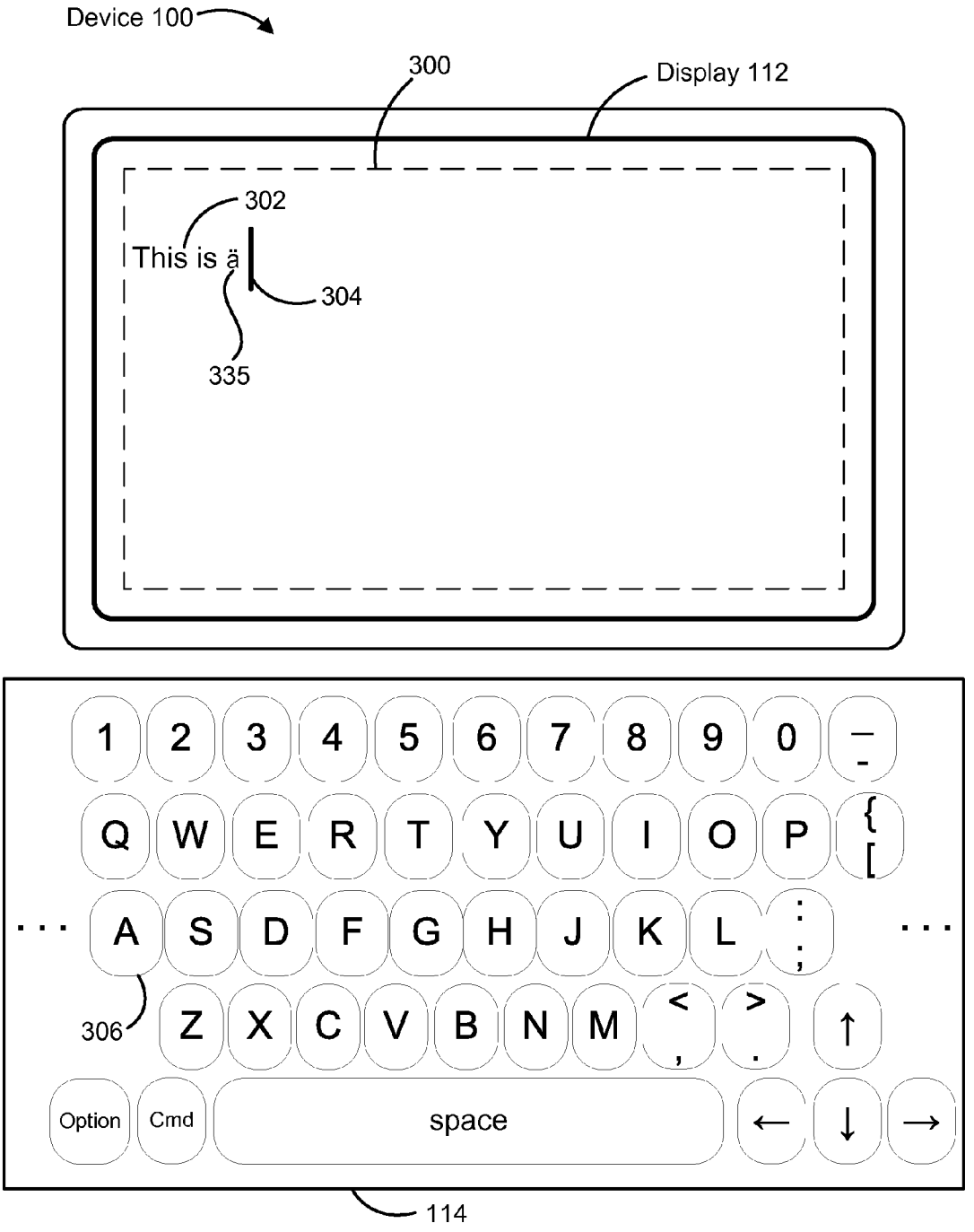
Figure 3J


Device 100
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Display 112
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This is ä
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335
1 2 3 4 5 6 7 8 9 0 – -
Q W E R T Y U I O P { [
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306
Z X C V B N M < , > . ↑
Option Cmd space ← ↓ →
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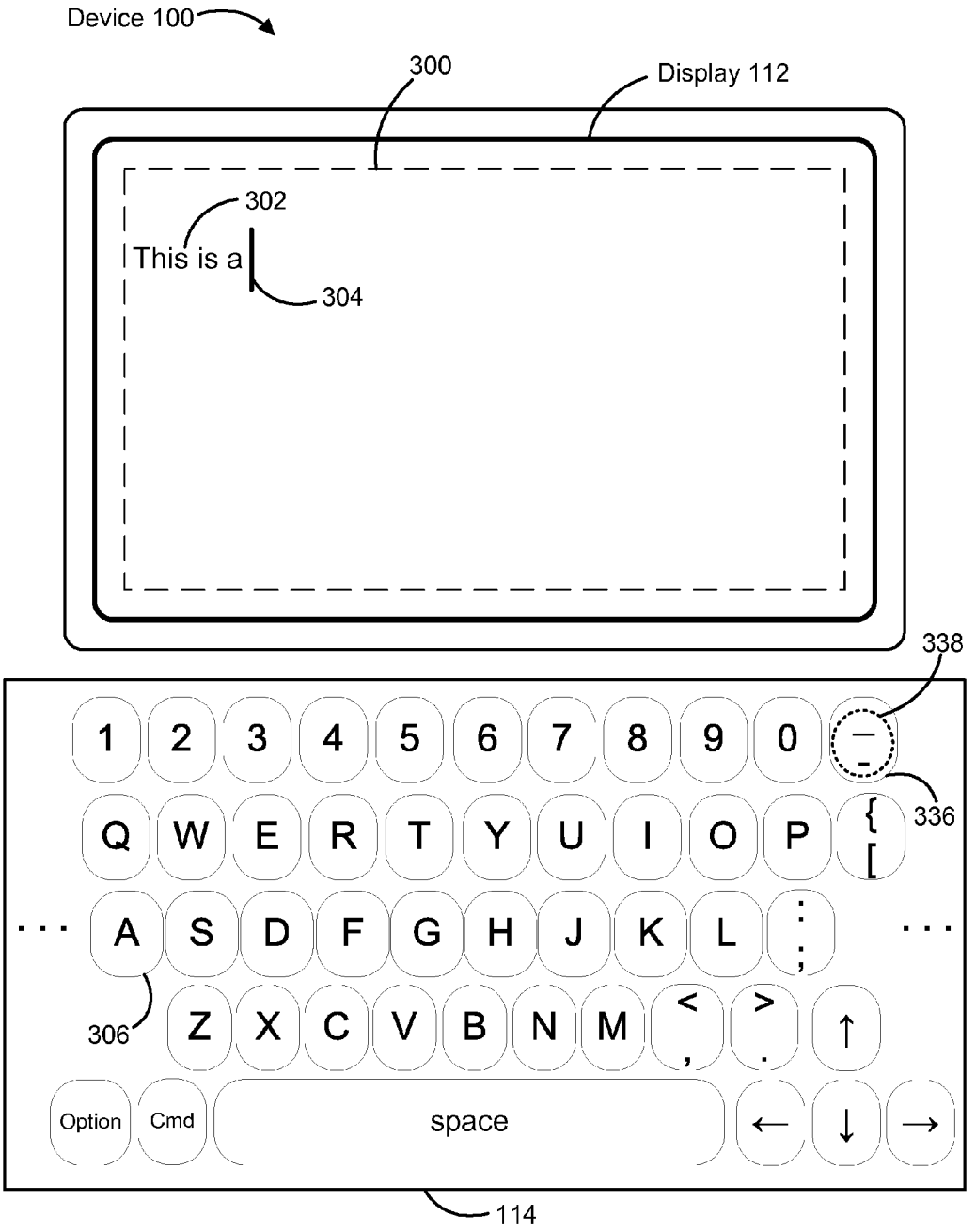
Figure 3K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Display 112
302
This is a
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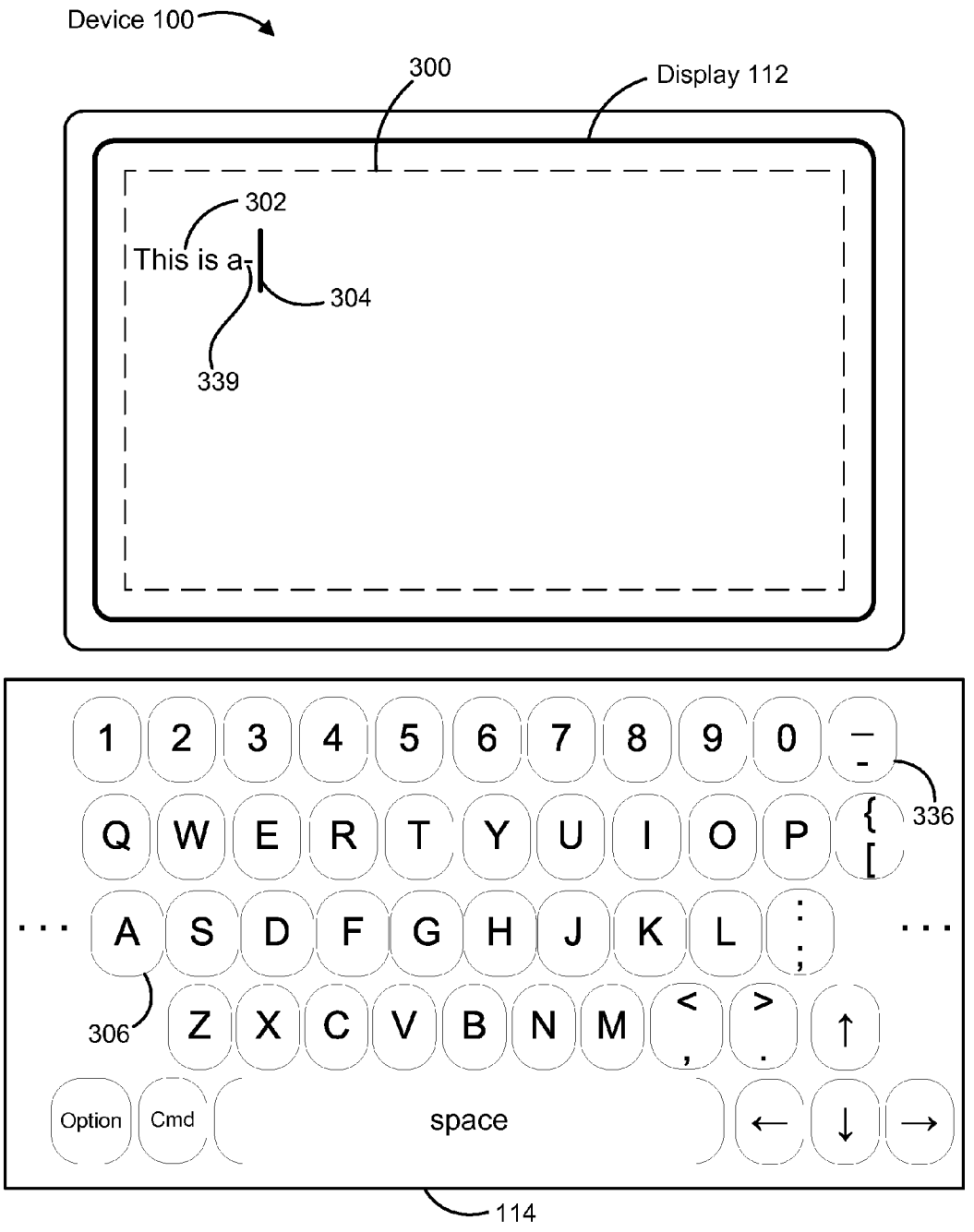
Figure 3L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A S D F G H J K L : ;
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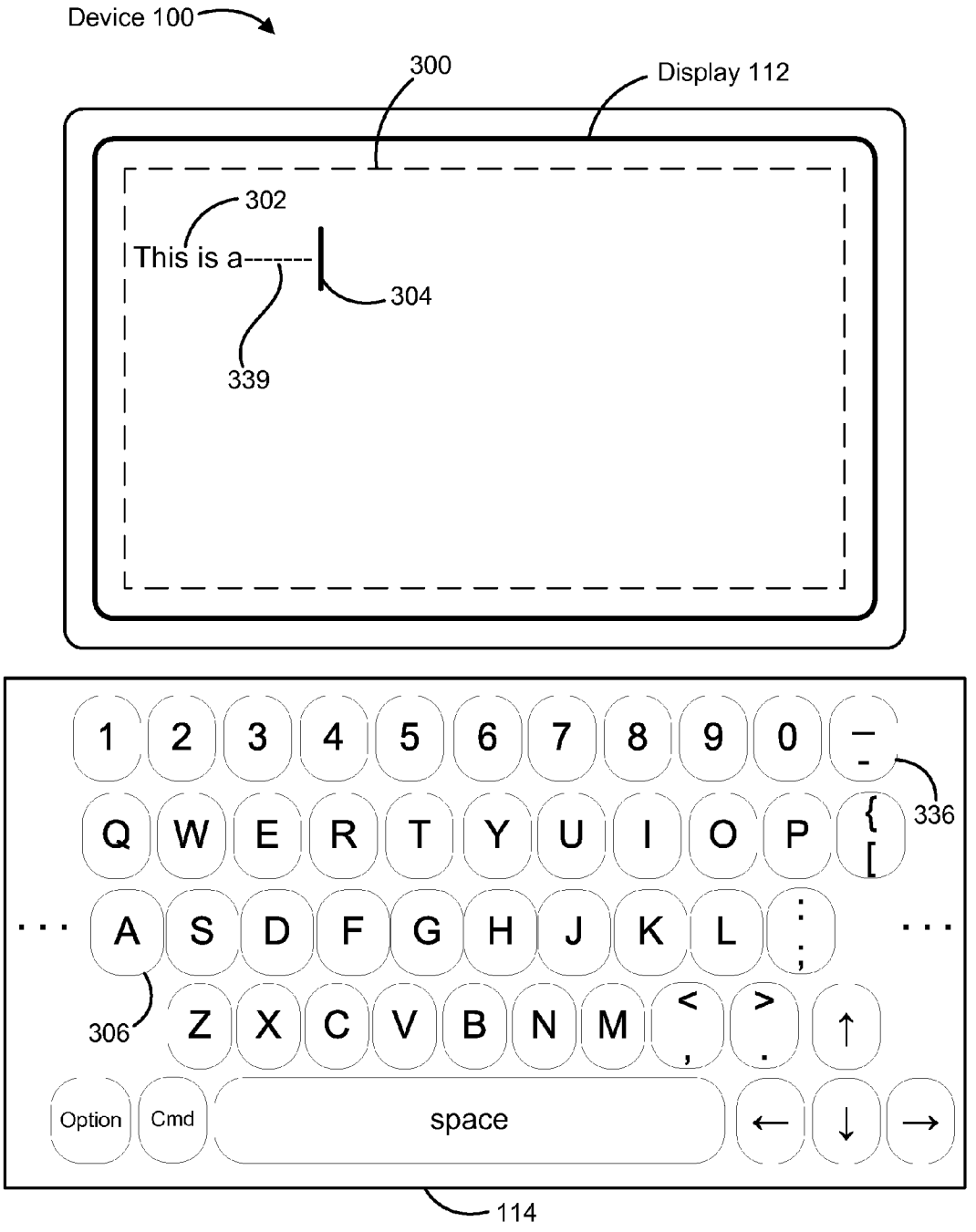
Figure 3M


Device 100
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Display 112
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339
1 2 3 4 5 6 7 8 9 0 - _
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Q W E R T Y U I O P { [
A S D F G H J K L : ;
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Option Cmd space ← ↓ →
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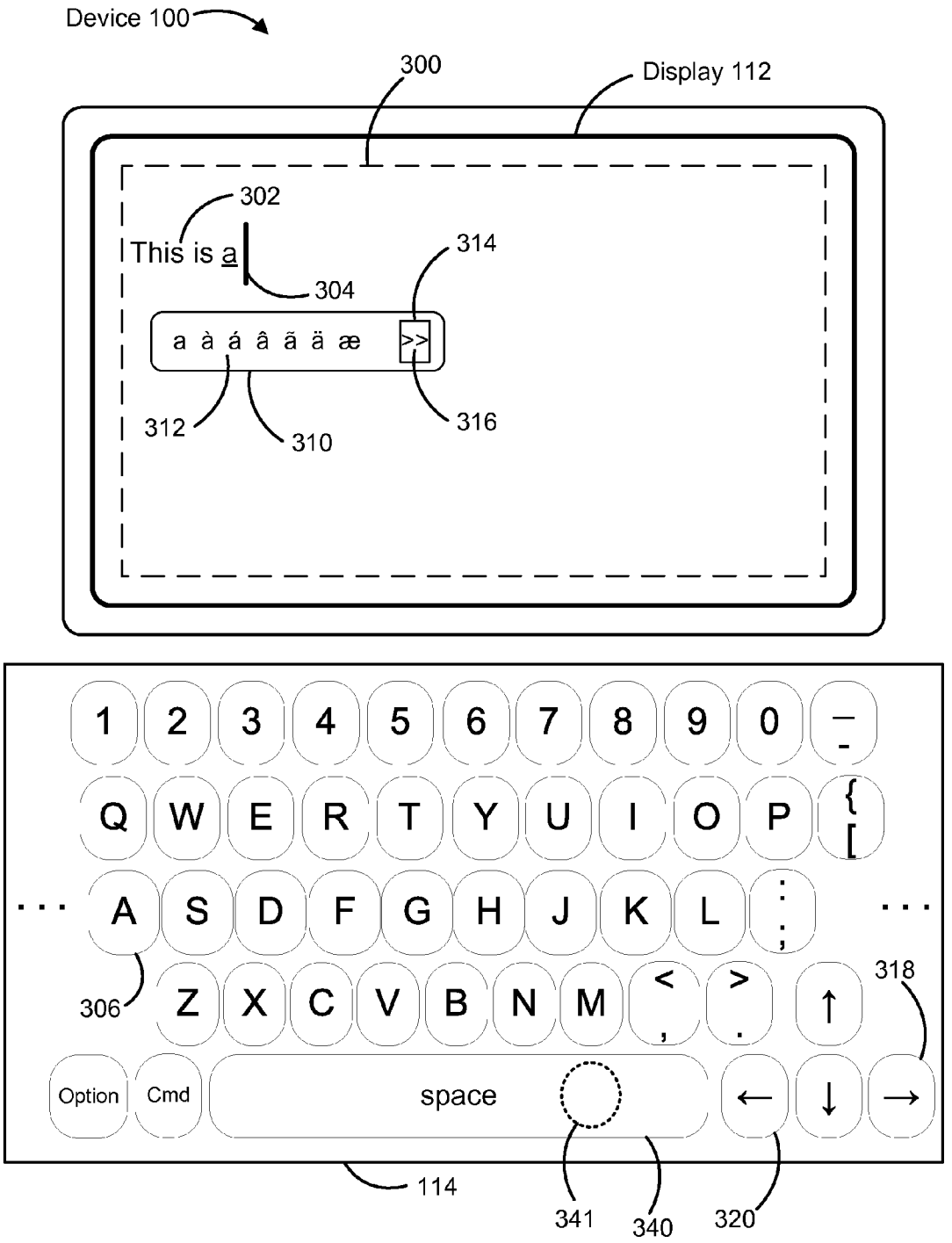
Figure 3N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Q W E R T Y U I O P { [
A S D F G H J K L : ;
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318
Option Cmd space ← ↓ →
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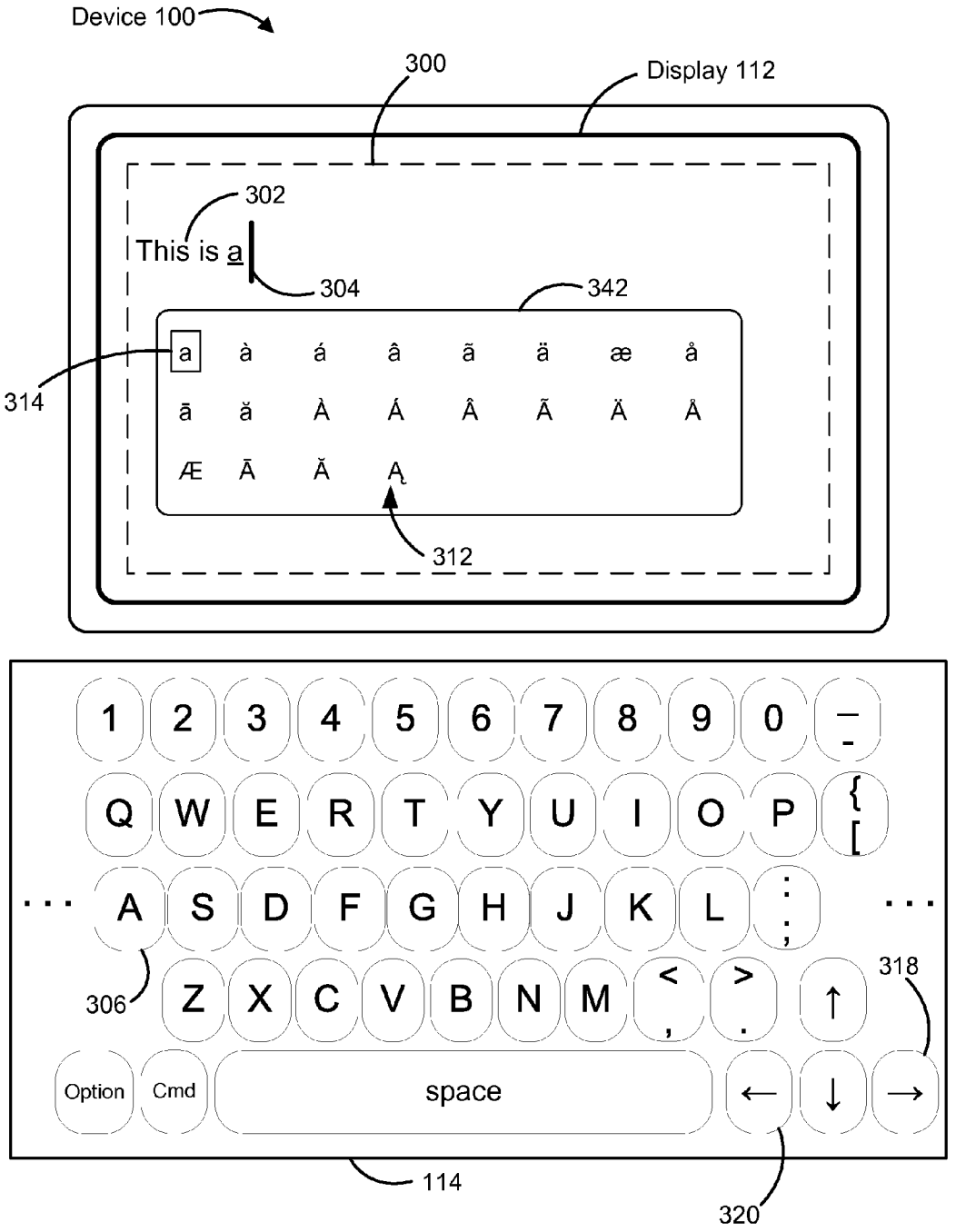
Figure 3O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Option Cmd space
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320

Figure 3P

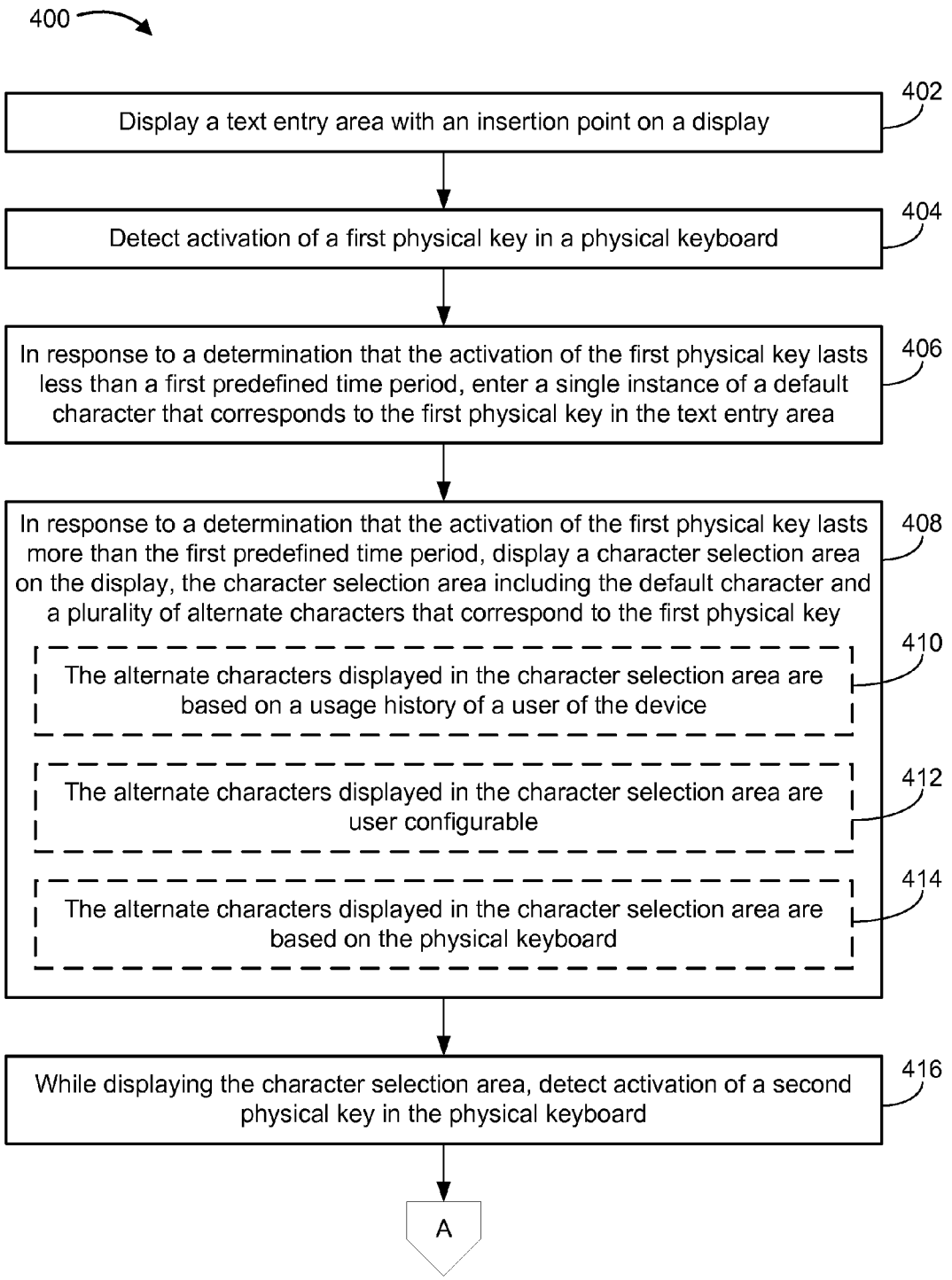
400
Display a text entry area with an insertion point on a display
402
Detect activation of a first physical key in a physical keyboard
404
In response to a determination that the activation of the first physical key lasts less than a first predefined time period, enter a single instance of a default character that corresponds to the first physical key in the text entry area
406
In response to a determination that the activation of the first physical key lasts more than the first predefined time period, display a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key
408
The alternate characters displayed in the character selection area are based on a usage history of a user of the device
410
The alternate characters displayed in the character selection area are user configurable
412
The alternate characters displayed in the character selection area are based on the physical keyboard
414
While displaying the character selection area, detect activation of a second physical key in the physical keyboard
416
A

Figure 4A

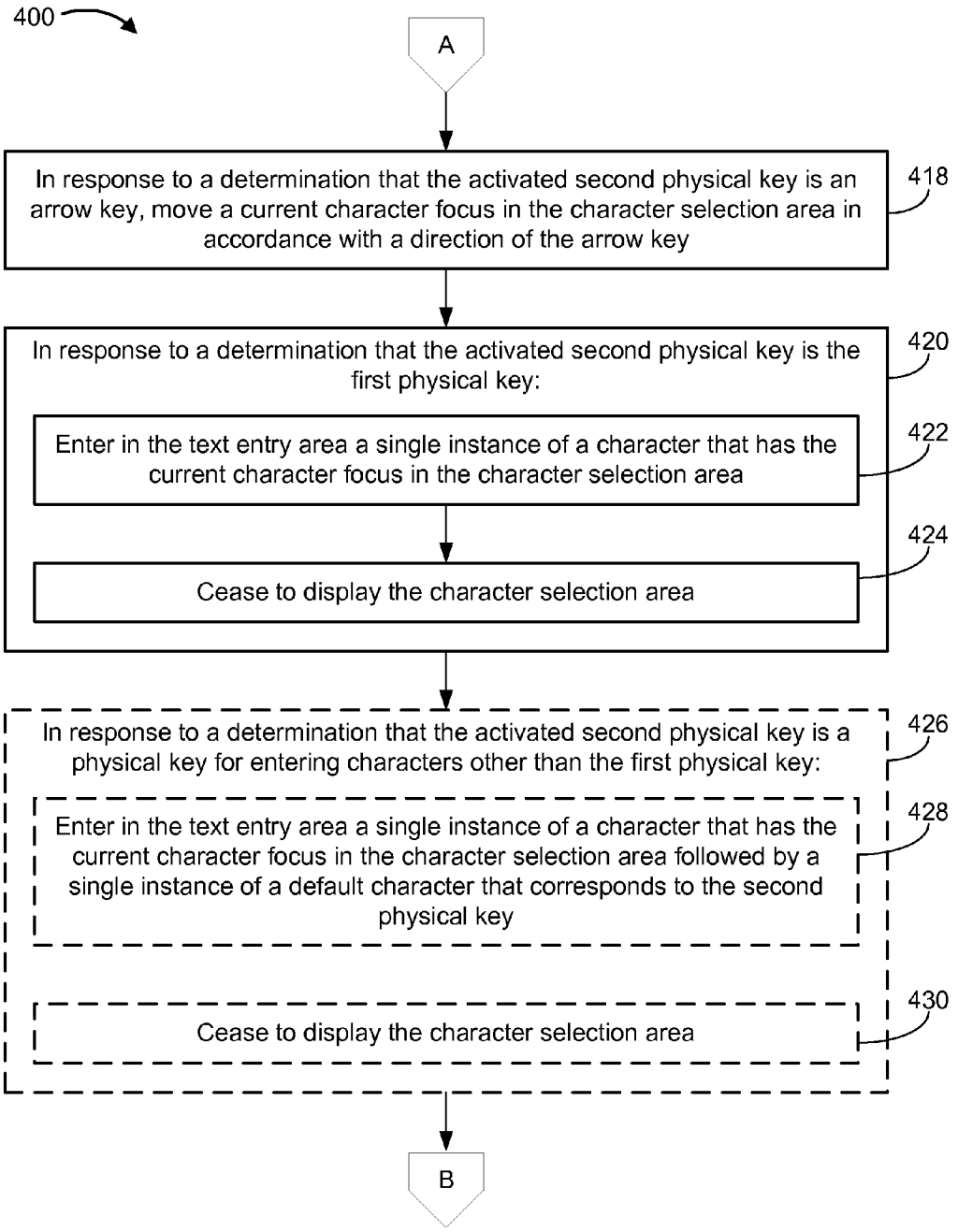
400
A
In response to a determination that the activated second physical key is an arrow key, move a current character focus in the character selection area in accordance with a direction of the arrow key
418
In response to a determination that the activated second physical key is the first physical key:
420
Enter in the text entry area a single instance of a character that has the current character focus in the character selection area
422
Cease to display the character selection area
424
In response to a determination that the activated second physical key is a physical key for entering characters other than the first physical key:
426
Enter in the text entry area a single instance of a character that has the current character focus in the character selection area followed by a single instance of a default character that corresponds to the second physical key
428
Cease to display the character selection area
430
B

Figure 4B

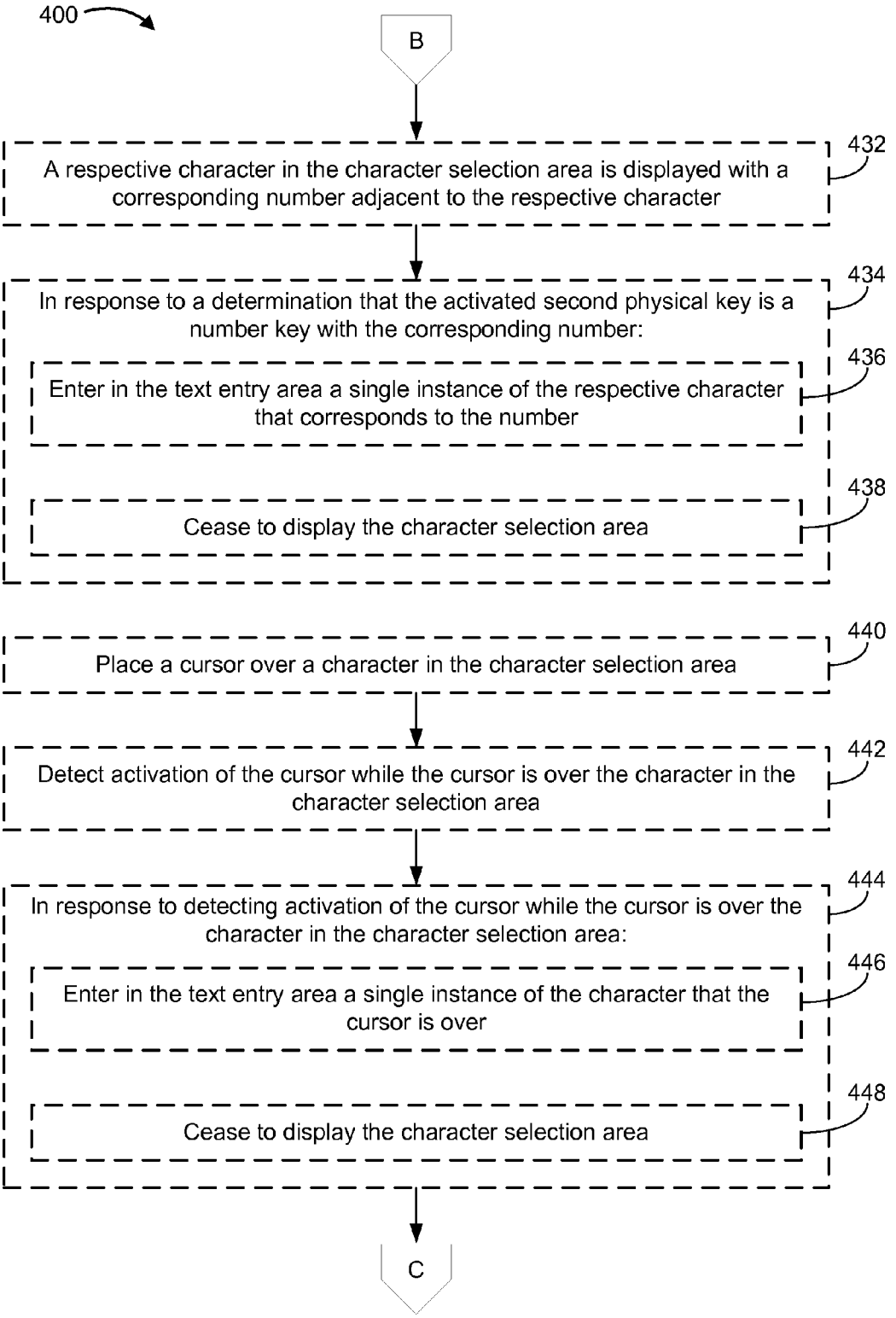
400
B
A respective character in the character selection area is displayed with a corresponding number adjacent to the respective character
432
In response to a determination that the activated second physical key is a number key with the corresponding number:
434
Enter in the text entry area a single instance of the respective character that corresponds to the number
436
Cease to display the character selection area
438
Place a cursor over a character in the character selection area
440
Detect activation of the cursor while the cursor is over the character in the character selection area
442
In response to detecting activation of the cursor while the cursor is over the character in the character selection area:
444
Enter in the text entry area a single instance of the character that the cursor is over
446
Cease to display the character selection area
448
C

Figure 4C

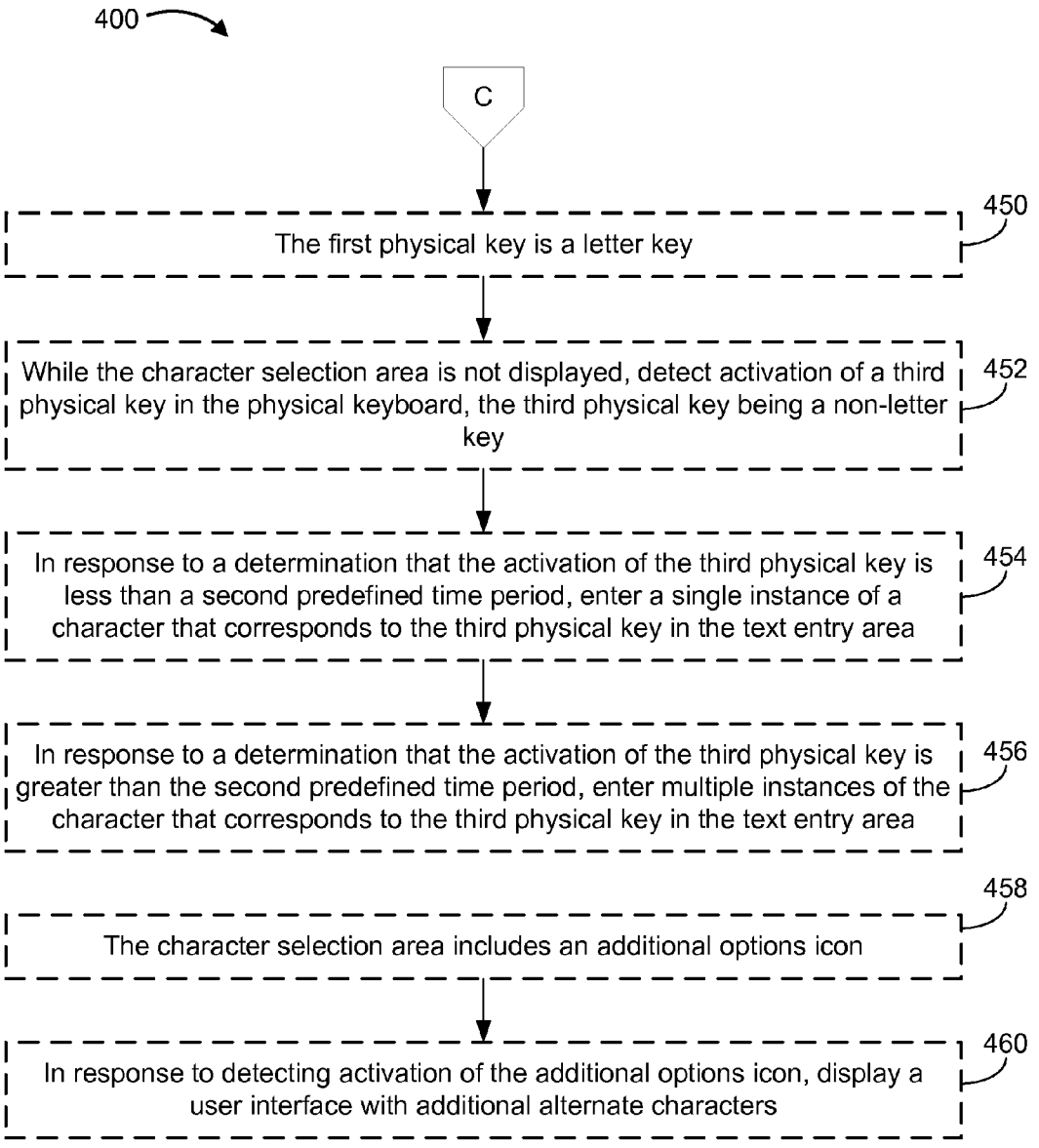
400
C
The first physical key is a letter key
450
While the character selection area is not displayed, detect activation of a third physical key in the physical keyboard, the third physical key being a non-letter key
452
In response to a determination that the activation of the third physical key is less than a second predefined time period, enter a single instance of a character that corresponds to the third physical key in the text entry area
454
In response to a determination that the activation of the third physical key is greater than the second predefined time period, enter multiple instances of the character that corresponds to the third physical key in the text entry area
456
The character selection area includes an additional options icon
458
In response to detecting activation of the additional options icon, display a user interface with additional alternate characters
460

Figure 4D

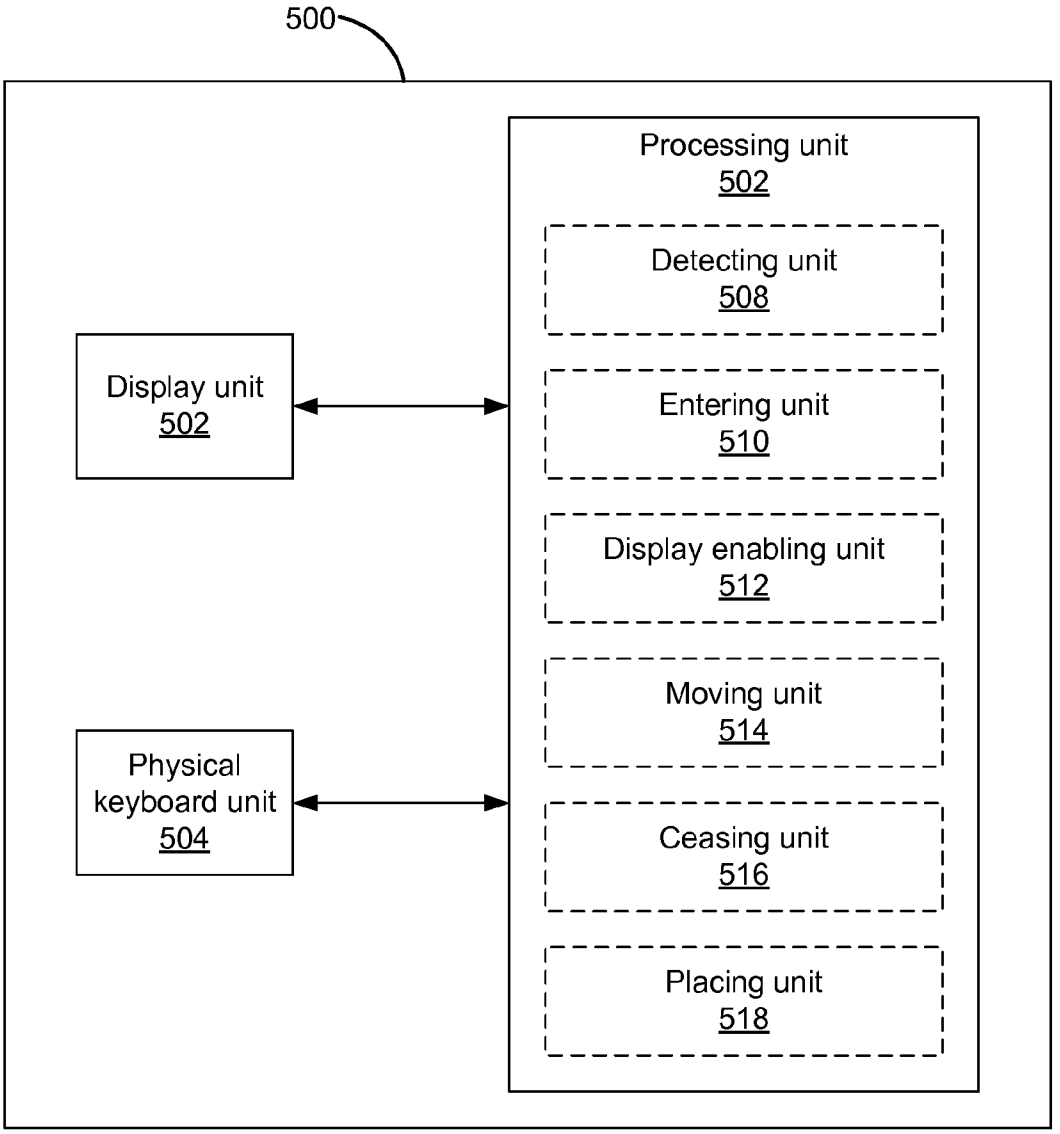
500
Processing unit
502
Detecting unit
508
Display unit
502
Entering unit
510
Display enabling unit
512
Moving unit
514
Physical
keyboard unit
504
Ceasing unit
516
Placing unit
518

Figure 5

DEVICE, METHOD, AND GRAPHICAL USER INTERFACE FOR ENTERING ALTERNATE CHARACTERS WITH A PHYSICAL KEYBOARD

RELATED APPLICATION

This claims priority to U.S. Provisional Application Ser. No. 61/493,351, filed Jun. 3, 2011, entitled "Device, Method, and Graphical User Interface for Entering Alternate Characters with a Physical Keyboard," which is incorporation herein by reference in its entirety.

TECHNICAL FIELD

This relates generally to electronic devices with physical keyboards, including but not limited to electronic devices with physical keyboards that input alternate characters from the characters shown on the physical keys.

BACKGROUND

Text entry is a common activity on computers and other electronics devices. Whether it be composing a document, entering identifying information, or typing a message, text entry is an inescapable part of a user's computing experience. For text input via a physical keyboard (as opposed to a soft or virtual keyboard), the physical keyboard is limited to showing a default set of characters on the physical keys for text input. Various methods have been developed to allow physical keyboards to enter alternate characters rather than the default characters shown on the physical keys.

But existing methods for entering alternate characters via physical keyboards are cumbersome and inefficient. For example, entering alternate characters that include diacritical marks is tedious and creates a significant cognitive burden on a user. In addition, existing methods take longer than necessary, thereby wasting energy. This latter consideration is particularly important in battery-operated devices.

SUMMARY

Accordingly, there is a need for electronic devices with faster, more efficient methods and interfaces for entering alternate characters using a physical keyboard. Such methods and interfaces may complement or replace conventional methods for entering alternate characters. Such methods and interfaces reduce the cognitive burden on a user and produce a more efficient human-machine interface. For battery-operated devices, such methods and interfaces conserve power and increase the time between battery charges.

The above deficiencies and other problems associated with electronic devices with physical keyboards are reduced or eliminated by the disclosed devices. In some embodiments, the device is a desktop computer. In some embodiments, the device is portable (e.g., a notebook computer, tablet computer, or handheld device). In some embodiments, the device also has a touchpad. In some embodiments, the device also has a touch-sensitive display (also known as a "touch screen" or "touch screen display"). In some embodiments, the device has a graphical user interface (GUI), one or more processors, memory and one or more modules, programs or sets of instructions stored in the memory for performing multiple functions. In some embodiments, the user interacts with the GUI primarily through finger contacts and gestures on the touch-sensitive surface. In some embodiments, the functions may include image editing, drawing, presenting, word processing, website creating, disk authoring, spreadsheet making, game playing, telephoning, video conferencing, e-mailing, instant messaging, workout support, digital photographing, digital videoing, web browsing, digital music playing, and/or digital video playing. Executable instructions for performing these functions may be included in a non-transitory computer readable storage medium or other computer program product configured for execution by one or more processors.

In accordance with some embodiments, a method is performed at an electronic device with a display and a physical keyboard. The method includes: displaying a text entry area with an insertion point on the display; detecting activation of a first physical key in the physical keyboard; in response to a determination that the activation of the first physical key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first physical key in the text entry area; in response to a determination that the activation of the first physical key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; while displaying the character selection area, detecting activation of a second physical key in the physical keyboard; in response to a determination that the activated second physical key is an arrow key, moving a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: entering in the text entry area a single instance of a character that has the current character focus in the character selection area and ceasing to display the character selection area.

In accordance with some embodiments, an electronic device includes a display, a physical keyboard, one or more processors, memory, and one or more programs. The one or more programs are stored in the memory and configured to be executed by the one or more processors. The one or more programs include instructions for: displaying a text entry area with an insertion point on the display; detecting activation of a first physical key in the physical keyboard; in response to a determination that the activation of the first physical key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first physical key in the text entry area; in response to a determination that the activation of the first physical key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; while displaying the character selection area, detecting activation of a second physical key in the physical keyboard; in response to a determination that the activated second physical key is an arrow key, moving a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: entering in the text entry area a single instance of a character that has the current character focus in the character selection area and ceasing to display the character selection area.

In accordance with some embodiments, a computer readable storage medium has stored therein instructions which when executed by an electronic device with a display and a physical keyboard, cause the device to: display a text entry area with an insertion point on the display; detect activation of a first physical key in the physical keyboard; in response to a determination that the activation of the first physical key lasts

less than a first predefined time period, enter a single instance of a default character that corresponds to the first physical key in the text entry area; in response to a determination that the activation of the first physical key lasts more than the first predefined time period, display a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; while displaying the character selection area, detect activation of a second physical key in the physical keyboard; in response to a determination that the activated second physical key is an arrow key, move a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: enter in the text entry area a single instance of a character that has the current character focus in the character selection area and cease to display the character selection area.

In accordance with some embodiments, a graphical user interface on an electronic device with a display, physical keyboard, a memory, and one or more processors to execute one or more programs stored in the memory includes a text entry area with an insertion point. In response to a determination that an activation of a first physical key in the physical keyboard lasts less than a first predefined time period, a single instance of a default character that corresponds to the first physical key is entered in the text entry area. In response to a determination that the activation of the first physical key lasts more than the first predefined time period, a character selection area is displayed on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key. While displaying the character selection area, activation of a second physical key in the physical keyboard is detected. In response to a determination that a second physical key in the physical keyboard, activated while the character selection area is displayed, is an arrow key, a current character focus in the character selection area is moved in accordance with a direction of the arrow key. In response to a determination that the activated second physical key is the first physical key, a single instance of a character that has the current character focus in the character selection area is entered in the text entry area, and the character selection area ceases to be displayed.

In accordance with some embodiments, an electronic device includes: a display; physical keyboard; means for displaying a text entry area with an insertion point on the display; means for detecting activation of a first physical key in the physical keyboard; means for, in response to a determination that the activation of the first physical key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first physical key in the text entry area; means for, in response to a determination that the activation of the first physical key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; means for, while displaying the character selection area, detecting activation of a second physical key in the physical keyboard; means for, in response to a determination that the activated second physical key is an arrow key, moving a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: means for entering in the text entry area a single instance of a character that has the current character focus in the character selection area, and means for ceasing to display the character selection area.

In accordance with some embodiments, an information processing apparatus for use in an electronic device with a display and a physical keyboard includes: means for displaying a text entry area with an insertion point on the display; means for detecting activation of a first physical key in the physical keyboard; means for, in response to a determination that the activation of the first physical key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first physical key in the text entry area; means for, in response to a determination that the activation of the first physical key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; means for, while displaying the character selection area, detecting activation of a second physical key in the physical keyboard; means for, in response to a determination that the activated second physical key is an arrow key, moving a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: means for entering in the text entry area a single instance of a character that has the current character focus in the character selection area, and means for ceasing to display the character selection area.

In accordance with some embodiments, an electronic device includes a display unit configured to display a text entry area with an insertion point, a physical keyboard unit configured to receive activations of physical keys in the physical keyboard unit, and a processing unit coupled to the display unit and the physical keyboard unit. The processing unit is configured to: detect activation of a first physical key in the physical keyboard unit; in response to a determination that the activation of the first physical key lasts less than a first predefined time period, enter a single instance of a default character that corresponds to the first physical key in the text entry area; in response to a determination that the activation of the first physical key lasts more than the first predefined time period, enable display of a character selection area on the display unit, the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; while displaying the character selection area, detect activation of a second physical key in the physical keyboard unit; in response to a determination that the activated second physical key is an arrow key, move a current character focus in the character selection area in accordance with a direction of the arrow key; and in response to a determination that the activated second physical key is the first physical key: enter in the text entry area a single instance of a character that has the current character focus in the character selection area, and cease to display the character selection area.

Thus, electronic devices with displays and physical keyboards are provided with faster, more efficient methods and interfaces for entering alternate characters, thereby increasing the effectiveness, efficiency, and user satisfaction with such devices. Such methods and interfaces may complement or replace conventional methods for entering alternate characters.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the aforementioned embodiments of the invention as well as additional embodiments

thereof, reference should be made to the Description of Embodiments below, in conjunction with the following drawings in which like reference numerals refer to corresponding parts throughout the figures.

FIG. **1** is a block diagram of an exemplary electronic device with a display and a physical keyboard in accordance with some embodiments.

FIGS. **2**A-**2**B illustrate exemplary electronic devices having physical keyboards in accordance with some embodiments.

FIGS. **3**A-**3**P illustrate exemplary user interfaces for entering alternate characters using a physical keyboard in accordance with some embodiments.

FIGS. **4**A-**4**D are flow diagrams illustrating a method of entering alternate characters using a physical keyboard in accordance with some embodiments.

FIG. **5** is a functional block diagram of an electronic device in accordance with some embodiments.

DESCRIPTION OF EMBODIMENTS

Sometimes a user may need to enter variants of a character, such as a combination of the character with a diacritical mark. Existing methods of entering alternate characters typically require the user to remember a particular combination of physical keys (e.g., shift+option+key); enter a code (which the user has to memorize or look up) associated with the desired character; or navigate through multiple menus and options. A more efficient method of entering such character variants is described below. To enter a variant or alternate of a character, the physical key to which the character corresponds is activated for a duration longer than a predefined time period. A temporary character selection area is displayed with the default character and the alternate characters. The desired character is selected from the character selection area by any one of several complementary methods, such as highlighting the desired character and activating the physical key again, or clicking on the desired character with a mouse or touchpad.

Below, FIGS. **1**, **2**A, **2**B, and **5** provide a description of exemplary devices. FIGS. **3**A-**3**P illustrate exemplary user interfaces for entering alternate characters using a physical keyboard. FIGS. **4**A-**4**D are flow diagrams illustrating a method of entering alternate characters using a physical keyboard. The user interfaces in FIGS. **3**A-**3**P are used to illustrate the processes in FIGS. **4**A-**4**D.

Exemplary Devices

Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components, circuits, and networks have not been described in detail so as not to unnecessarily obscure aspects of the embodiments.

It will also be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first contact could be termed a second contact, and, similarly, a second contact could be termed a first contact, without departing from the scope of the present invention.

The terminology used in the description of the invention herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used in the description of the invention and the appended claims, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms "includes," "including," "comprises," and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

As used herein, the term "if" may be construed to mean "when" or "upon" or "in response to determining" or "in response to detecting," depending on the context. Similarly, the phrase "if it is determined" or "if [a stated condition or event] is detected" may be construed to mean "upon determining" or "in response to determining" or "upon detecting [the stated condition or event]" or "in response to detecting [the stated condition or event]," depending on the context.

Embodiments of electronic devices, user interfaces for such devices, and associated processes for using such devices are described. In some embodiments, the device is a portable communications device, such as a mobile telephone with a physical keyboard, which also contains other functions, such as PDA and/or music player functions. Other portable electronic devices, such as laptops or tablet computers with physical keyboards, may also be used. It should also be understood that, in some embodiments, the device is not a portable communications device, but is a desktop computer with a physical keyboard.

In the discussion that follows, an electronic device that includes a display and a physical keyboard is described. It should be understood, however, that the electronic device may include one or more other physical user-interface devices, such as a mouse and/or a joystick.

The device typically supports a variety of applications, such as one or more of the following: a drawing application, a presentation application, a word processing application, a website creation application, a disk authoring application, a spreadsheet application, a gaming application, a telephone application, a video conferencing application, an e-mail application, an instant messaging application, a workout support application, a photo management application, a digital camera application, a digital video camera application, a web browsing application, a digital music player application, and/or a digital video player application.

The various applications that may be executed on the device may use at least one common physical user-interface device, such as the physical keyboard. One or more functions of the physical keyboard as well as corresponding information displayed on the device may be adjusted and/or varied from one application to the next and/or within a respective application. In this way, a common physical architecture (such as the physical keyboard) of the device may support the variety of applications with user interfaces that are intuitive and transparent to the user.

FIG. **1** is a block diagram of an exemplary electronic device with a display and a physical keyboard in accordance with some embodiments. Device **100** need not be portable. In some embodiments, device **100** is a laptop computer, a desktop computer, a tablet computer, a multimedia player device, a navigation device, an educational device (such as a child's

learning toy), a gaming system, a portable communications device (e.g., a mobile phone or smartphone), or a control device (e.g., a home or industrial controller). Device **100** typically includes one or more processing units (CPU's) **102**, one or more network or other communications interfaces **104**, memory **106**, and one or more communication buses **108** for interconnecting these components. Communication buses **108** may include circuitry (sometimes called a chipset) that interconnects and controls communications between system components. Device **100** includes input/output (I/O) interface **110** comprising display **112**, which may be a touch screen display, and a physical keyboard **114**. I/O interface **110** may also include a mouse (or other pointing device) **116** and/or touchpad **118**. Memory **106** includes high-speed random access memory, such as DRAM, SRAM, DDR RAM or other random access solid state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory **106** may optionally include one or more storage devices remotely located from CPU(s) **102**.

It should be appreciated that device **100** is only one example of an electronic device, and that device **100** may have more or fewer components than shown, may combine two or more components, or may have a different configuration or arrangement of the components. The various components shown in FIG. **1** may be implemented in hardware, software, or a combination of both hardware and software, including one or more signal processing and/or application specific integrated circuits.

In some embodiments, the software components stored in memory **106** include operating system **126**, communication module (or set of instructions) **128**, contact/motion module (or set of instructions) **130**, graphics module (or set of instructions) **132**, text input module (or set of instructions) **134**, and applications (or sets of instructions) **136**. Furthermore, in some embodiments memory **102** stores device/global internal state **157**, as shown in FIG. **1**. Device/global internal state **157** includes one or more of: active application state, indicating which applications, if any, are currently active; display state, indicating what applications, views or other information occupy various regions of display **112**; and input state, including information obtained from the device's input control devices (e.g., physical keyboard **114**, mouse **116**, and/or touchpad **118**).

Operating system **126** (e.g., Darwin, RTXC, LINUX, UNIX, OS X, WINDOWS, or an embedded operating system such as VxWorks) includes various software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communication between various hardware and software components.

Communication module **128** facilitates communication with other devices over one or more communication buses **108** and also includes various software components for handling data received through communication buses **108**. In some embodiments, communication module **128** facilitates communication with devices in I/O interface **110**, such as physical keyboard **114** and mouse **116**.

Contact/motion module **130** may detect contact with touchpad **118** and other touch sensitive devices (e.g., a touch screen). Contact/motion module **130** includes various software components for performing various operations related to detection of contact, such as determining if contact has occurred (e.g., detecting a finger-down event), determining if there is movement of the contact and tracking the movement across a touch-sensitive surface (e.g., detecting one or more finger-dragging events), and determining if the contact has ceased (e.g., detecting a finger-up event or a break in contact). Contact/motion module **130** receives contact data from the touch-sensitive surface (e.g., touchpad **118**). Determining movement of the point of contact, which is represented by a series of contact data, may include determining speed (magnitude), velocity (magnitude and direction), and/or an acceleration (a change in magnitude and/or direction) of the point of contact. These operations may be applied to single contacts (e.g., one finger contacts) or to multiple simultaneous contacts (e.g., "multitouch"/multiple finger contacts).

Contact/motion module **130** may detect a gesture input by a user. Different gestures on the touch-sensitive surface have different contact patterns. Thus, a gesture may be detected by detecting a particular contact pattern. For example, detecting a finger tap gesture includes detecting a finger-down event followed by detecting a finger-up (lift off) event at the same position (or substantially the same position) as the finger-down event (e.g., at the position of an icon). As another example, detecting a finger swipe gesture on the touch-sensitive surface includes detecting a finger-down event followed by detecting one or more finger-dragging events, and subsequently followed by detecting a finger-up (lift off) event.

Graphics module **132** includes various known software components for rendering and displaying graphics on display **112** or other display, including components for changing the intensity of graphics that are displayed. As used herein, the term "graphics" includes any object that can be displayed to a user, including without limitation text, web pages, icons (such as user-interface objects including soft keys), digital images, videos, animations and the like.

In some embodiments, graphics module **132** stores data representing graphics to be used. Each graphic may be assigned a corresponding code. Graphics module **132** receives, from applications etc., one or more codes specifying graphics to be displayed along with, if necessary, coordinate data and other graphic property data, and then generates screen image data to output to display **112**.

Text input module **134**, which may be a component of graphics module **132**, provides soft keyboards or mappings of physical keys in a physical keyboard to various key layouts for entering text in various applications (e.g., contacts **137**, e-mail **140**, IM **141**, browser **147**, and any other application that needs text input).

Applications **136** may include the following modules (or sets of instructions), or a subset or superset thereof:

- contacts module **137** (sometimes called an address book or contact list);
- telephone module **138**;
- video conferencing module **139**;
- e-mail client module **140**;
- instant messaging (IM) module **141**;
- workout support module **142**;
- camera module **143** for still and/or video images;
- image management module **144**;
- browser module **147**;
- calendar module **148**;
- widget modules **149**, which may include one or more of: weather widget **149-1**, stocks widget **149-2**, calculator widget **149-3**, alarm clock widget **149-4**, dictionary widget **149-5**, and other widgets obtained by the user, as well as user-created widgets **149-6**;
- widget creator module **150** for making user-created widgets **149-6**;
- search module **151**; and/or
- video and music player module **152**, which may be made up of a video player module and a music player module.

Examples of other applications **136** that may be stored in memory **102** include drawing module **180**, presentation module **182**, word processing module **184**, website creation module **186**, disk authoring module **188**, spreadsheet module **190**, other image editing applications, JAVA-enabled applications, encryption, digital rights management, voice recognition, and/or voice replication.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, contacts module **137** may be used to manage an address book or contact list (e.g., stored in application internal state **192** of contacts module **137** in memory **106**), including: adding name(s) to the address book; deleting name(s) from the address book; associating telephone number(s), e-mail address(es), physical address(es) or other information with a name; associating an image with a name; categorizing and sorting names; providing telephone numbers or e-mail addresses to initiate and/or facilitate communications by telephone **138**, video conference **139**, e-mail **140**, or IM **141**; and so forth.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, telephone module **138** may be used to enter a sequence of characters corresponding to a telephone number, access one or more telephone numbers in address book **137**, modify a telephone number that has been entered, dial a respective telephone number, conduct a conversation and disconnect or hang up when the conversation is completed. In some embodiments, telephone module **138** facilitates telephony by voice over Internet Protocol (VOIP).

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, text input module **134**, contact list **137**, and telephone module **138**, videoconferencing module **139** includes executable instructions to initiate, conduct, and terminate a video conference between a user and one or more other participants in accordance with user instructions.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, e-mail client module **140** includes executable instructions to create, send, receive, and manage e-mail in response to user instructions. In conjunction with image management module **144**, e-mail client module **140** makes it very easy to create and send e-mails with still or video images.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, the instant messaging module **141** includes executable instructions to enter a sequence of characters corresponding to an instant message, to modify previously entered characters, to transmit a respective instant message (for example, using XMPP, SIMPLE, or IMPS for Internet-based instant messages), to receive instant messages and to view received instant messages. In some embodiments, transmitted and/or received instant messages may include graphics, photos, audio files, video files and/or other attachments.

In conjunction with display **112**, communication module **128**, optical sensor(s) (not shown), contact module **130**, graphics module **132**, and image management module **144**, camera module **143** includes executable instructions to capture still images or video (including a video stream) and store them into memory **102**, modify characteristics of a still image or video, or delete a still image or video from memory **102**.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, text input module **134**, and camera module **143**, image management module **144** includes executable instructions to arrange, modify (e.g., edit), or otherwise manipulate, label, delete, present (e.g., in a digital slide show or album), and store still and/or video images.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, browser module **147** includes executable instructions to browse the Internet in accordance with user instructions, including searching, linking to, receiving, and displaying web pages or portions thereof, as well as attachments and other files linked to web pages.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, text input module **134**, e-mail client module **140**, and browser module **147**, calendar module **148** includes executable instructions to create, display, modify, and store calendars and data associated with calendars (e.g., calendar entries, to do lists, etc.) in accordance with user instructions.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, text input module **134**, and browser module **147**, widget modules **149** are mini-applications that may be downloaded and used by a user (e.g., weather widget **149-1**, stocks widget **149-2**, calculator widget **149-3**, alarm clock widget **149-4**, and dictionary widget **149-5**) or created by the user (e.g., user-created widget **149-6**). In some embodiments, a widget includes an HTML (Hypertext Markup Language) file, a CSS (Cascading Style Sheets) file, and a JavaScript file. In some embodiments, a widget includes an XML (Extensible Markup Language) file and a JavaScript file (e.g., Yahoo! Widgets).

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, text input module **134**, and browser module **147**, the widget creator module **150** may be used by a user to create widgets (e.g., turning a user-specified portion of a web page into a widget).

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, and text input module **134**, search module **151** includes executable instructions to search for text, music, sound, image, video, and/or other files in memory **102** that match one or more search criteria (e.g., one or more user-specified search terms) in accordance with user instructions.

In conjunction with display **112**, communication module **128**, contact module **130**, graphics module **132**, audio circuitry **110**, speaker **111**, and browser module **147**, video and music player module **152** includes executable instructions that allow the user to download and play back recorded music and other sound files stored in one or more file formats, such as MP3 or AAC files, and executable instructions to display, present or otherwise play back videos (e.g., on display **112**).

Each of the above identified elements in FIG. **1** may be stored in one or more of the previously mentioned memory devices. Each of the above identified modules corresponds to a set of instructions for performing a function described above. The above identified modules or programs (i.e., sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory **106** may store a subset of the modules and data structures identified above. Furthermore, memory **106** may store additional modules and data structures not described above.

FIGS. **2A-2B** illustrate exemplary multifunction devices having physical keyboards in accordance with some embodiments. FIG. **2A** illustrates a desktop computer **200**, which is an example of device **100**. Desktop computer **200** includes a display **202** (an example of display **112** in device **100**) and a physical keyboard **204** (an example of physical keyboard **114**

in device **100**). In some embodiments, display **202** and other components of desktop computer **200** (e.g., processor(s), memory, controllers, storage, etc.) are held together in a common chassis. In some other embodiments, display **202** is a distinct component (i.e., held in separate chassis) from the other components (e.g., processor(s), memory, controllers, storage, etc.).

Physical keyboard **204** includes a plurality of physical keys, at least some of which correspond to respective characters. When a key corresponding to a character is activated, the corresponding character may be entered as text, which may be displayed on display **202** (e.g., in a text entry area).

FIG. **2**B illustrates a laptop or notebook computer **210**, which is another example of device **100**. Laptop computer **210** includes a display **212** (an example of display **112** in device **100**) and a physical keyboard **214** (an example of physical keyboard **114** in device **100**). Display **212**, physical keyboard **214**, and other components of laptop computer **210** (e.g., processor(s), memory, controllers, storage, etc.) are held together in a common chassis.

Physical keyboard **214** includes a plurality of physical keys, at least some of which correspond to respective characters. When a key corresponding to a character is activated, the corresponding character may be entered as text, which may be displayed on display **212** (e.g., in a text entry area).

User Interfaces and Associated Processes

Attention is now directed towards embodiments of user interfaces ("UI") and associated processes that may be implemented on an electronic device with a display and a physical keyboard, such as device **100**.

FIGS. **3**A-**3**P illustrate exemplary user interfaces for entering alternate characters using a physical keyboard in accordance with some embodiments. The user interfaces in these figures are used to illustrate the processes described below, including the processes in FIGS. **4**A-**4**D. It should be appreciated that in FIGS. **3**A-**3**P, for sake of convenience, only certain components of device **100** (e.g., display **112** and physical keyboard **114**) are depicted.

FIG. **3**A illustrates text entry area **300** displayed on display **112** of a device (e.g., device **100**). Text entry area **300** may be displayed in a user interface of an application. In some embodiments, text entry area **300** is in a text entry field or in an application where a document (e.g., a text document, a presentation slide, a spreadsheet, a drawing, etc.) is displayed. Also displayed, in text entry area **300**, are input text **302** and insertion point **304**. Input text **302** includes text entered into text entry area **302** by a user. Insertion point **304** marks a position where the next entered character will be entered into input text **302**. Insertion point **304** may be displayed with empty input text **302** (e.g., when the user has not entered any text yet).

Device **100** also includes physical keyboard **114**. Physical keyboard **114** includes keys that correspond to characters (e.g., letters, punctuation marks, etc.) and functional keys (e.g., enter key, command key, shift key, etc.). A key on physical keyboard **114** may be activated by pressing down on the key. In some embodiments, a duration of the activation of a key is measured from when the key is pressed down to when the key is released.

Activation **308** of key **306** is detected on physical keyboard **114** of device **100**. As shown in FIG. **3**A, key **306** corresponds to the letter "A." The action taken by device **100** in response to the detection of activation **308** of key **306** depends on the duration of activation **308**. If activation **308** lasts less than a first predefined time period (e.g., 0.2, 0.3, 0.4, 0.5 seconds or any reasonable time), a single instance of character "a" **305** is entered into input text **302** at the position indicated by insertion point **304**, as shown in FIG. **3**B. Compared to FIG. **3**A, in FIG. **3**B input text **302** has character "a" **305** at the tail end and insertion point **304** has advanced to the next position after entry of character "a" **305**. In this example, character "a" **305** is the default character corresponding to key **306**. (As is known for physical keyboards, if a shift key (not shown) in physical keyboard **114** has been pressed when key **306** is activated, then the default character is "A," i.e., "a" is capitalized.)

If activation **308** lasts more than the first predefined time period, a character is not immediately entered. Instead, a character is provisionally entered into input text **302** (e.g., at the position indicated by insertion point **304**), pending selection of a character from character selection area **310**. For example, as shown in FIG. **3**C, provisional character **309** is entered into input text **302** with underlining; the underlining indicates that the "a" is provisionally entered pending selection of a character from character selection area **310**. Character selection area **310** is displayed on display **112** and includes candidate characters **312** and current character focus **314**.

Candidate characters **312** include the default character corresponding to activated key **306** (e.g., character "a" in FIG. **3**C) and alternate characters that correspond to activated key **306**. In some embodiments, the alternate characters include combinations of the default character corresponding to activated key **306** with diacritical or accent marks, or ligatures that include the default character corresponding to activated key **306**. For example, as shown in FIG. **3**C, the alternate characters include "à," "á," "â," "ã," "ä," and "æ."

In some embodiments, the alternate characters that are displayed as candidate characters **312** in character selection area **310** are selected for display by device **100** based on the usage history of a user of the device. For example, the alternate characters corresponding to key **306** that are displayed may be the most frequently used, amongst the alternate characters corresponding to key **306**, by a user of the device.

In some embodiments, the alternate characters that are displayed as candidate characters **312** in character selection area **310** are user configurable. That is, the user may configure which alternate characters are selected for display in character selection area **310**. For example, the user may configure the language or key-to-character mapping for keyboard **114**. The alternate characters that are displayed in character selection area **310** may change based on the language or mapping (which may be related to a language), as certain alternate characters may be used in some languages or mappings, but not others.

In some embodiments, the alternate characters that are displayed as candidate characters **312** in character selection area **310** are based on the physical keyboard. Different physical keyboards, with different key layouts, may correspond to different languages. As described above, certain alternate characters may be used in some languages, but not others. Thus, the alternate characters that are displayed in character selection area **310** may be based on the physical keyboard.

In some embodiments, a subset of available candidate characters **312** is displayed in character selection area **310**. Character selection area **310** includes an additional options icon **316** that, when activated, activates display of additional candidate characters **312**. The activation of the additional options icon **316** is further described below, with reference to FIGS. **3**O-**3**P.

Provisional character **309** is displayed as whichever candidate character **312** has the current character focus **314**.

Thus, in FIG. **3**C, the character "a" amongst candidate characters **312** has the current character focus **314**, and provisional character **309** is displayed as "a" with underlining. In some embodiments (not shown), just the current character focus **314** is shown, without showing the provisional character **309**.

While character selection area **310** is displayed, other keys on physical keyboard **114** may be activated. For example, FIG. **3**C shows detection of activation **322** of right arrow key **318**. In response to the detection of activation **322** of right arrow key **318**, current character focus **314** is moved, within character selection area **310**, in accordance with the direction of right arrow key **318**. Current character focus **314** moves rightward within character selection area **310** onto the character "à", in accordance with the direction of right arrow key **318**, as shown in FIG. **3**D. Provisional character **309** changes from "a" to "à" in accordance with the character that has the current character focus **314**. Other arrow keys, such as left arrow key **320**, an up arrow key, and a down arrow key, may also be used to move current character focus **314** in a direction corresponding to the arrow key direction.

FIG. **3**D also shows activation **324** of key **306** while the character "à" has the current character focus **314** within character selection area **310**. In response to the detection of activation **324** of key **306**, a single instance of character "à" **317** is entered into input text **302** at the position indicated by insertion point **304** and character selection area **310** ceases to be displayed, as shown in FIG. **3**E; whichever candidate character is displayed as provisional character **309** as a result of that candidate character having the current character focus **314** is entered into input text **302** when the originally activated key (key **306**) is activated while character selection area **310** is displayed.

FIGS. **3**F-**3**G illustrate an alternative way to enter one of the candidate characters **312** in character selection area **310**. FIG. **3**F shows character selection area **310**, continuing from FIG. **3**C, displayed in text entry area **300** on display **112**. Provisional character **309** is displayed in input text **302**, at the position indicated by insertion point **304**, as the candidate character **312** that has current character focus **314** in character selection area **310**. FIG. **3**F also shows activation **327** of key **326**, which corresponds to the letter "C" and is a different key from the originally activated "a" key **306**.

In response to the detection of activation **327** of key **326**, the two characters "ac" **329**, which includes a single instance of character "a" and a single instance of character "c," are entered into input text **302** at the position indicated by insertion point **304**, as shown in FIG. **3**G. The character "a" is the candidate character **312** that has the current character focus **314** in FIG. **3**F when key **326** is activated **327**, and is entered in place of provisional character **309**. The character "c" is the default character corresponding to key **326**. Also, character selection area **310** ceases to be displayed. In other words, by activating a character key other than the originally activated character key, a candidate character with the current focus that corresponds to the originally activated key is entered as well as a character corresponding to the character key other than the originally activated key. This facilitates faster typing of characters on physical keyboard **114**.

FIGS. **3**H-**3**I illustrates another alternative way to enter one of the candidate characters **312** in character selection area **310**. FIG. **3**H shows character selection area **310** displayed in text entry area **300** in response to the detection of activation **308** (FIG. **3**A) lasting longer than the first predefined time period. Character selection area **310** includes candidate characters **312**, current character focus **314**, and additional options icon **316**. In FIG. **3**H, character selection area further includes numbers **328** adjacent to candidate characters **312**. Numbers **328** includes integers 1 thru 7, each number **328** corresponding to a respective candidate character **312**. For example, the number "1" in numbers **328** corresponds to the character "a" in candidate characters **312**, the number "2" in numbers **328** corresponds to the character "à" in candidate characters **312**, the number "3" in numbers **328** corresponds to the character "á" in candidate characters **312**, and so on.

Activation **332** of key **330** on physical keyboard **114** is detected. Key **330** corresponds to the number (and character) "6." In response to the detection of activation **332** of key **330**, a single instance of character "ä" **333**, corresponding to the number "6" in character selection area **310**, is entered into input text **302** in place of provisional character **309**, as shown in FIG. **3**I, regardless of the character "a" having the current character focus **314** in character selection area **310**. Also, character selection area **310** ceases to be displayed.

FIGS. **3**J-**3**K illustrates another alternative way to enter one of the candidate characters **312** in character selection area **310**. FIG. **3**J shows character selection area **310**, continuing from FIG. **3**C, displayed in text entry area **300** on display **112**. Provisional character **309** is displayed in input text **302**, at the position indicated by insertion point **304**, as the candidate character **312** that has current character focus **314** in character selection area **310**. FIG. **3**J also shows cursor **334** placed over the character "ä" amongst candidate characters **312** in character selection area **310**. In some embodiments, cursor **334** is manipulated by a user using an input device of device **100** (e.g., mouse **116** or touchpad **118**). Cursor **334** may be activated by the user (e.g., by a left click on a multi-button mouse **116**, clicking on single-button mouse **116**, or tapping on touchpad **118**) while cursor **334** is over the character "ä" in character selection area **310**.

In response to detection of activation of cursor **334** over the character "ä" in character selection area **310**, a single instance of character "ä" **335** is entered into input text **302** in place of provisional character **309**, as shown in FIG. **3**K, regardless of the character "a" having the current character focus **314** in character selection area **310**. Also, character selection area **310** ceases to be displayed.

FIG. **3**L illustrates activation **338** of key **336** while character selection display **310** is not displayed (e.g., after a character has been entered into input text **302**). Key **336** is a non-letter key, corresponding to the non-letter character "-." Activation **338** is detected on key **336**.

The action taken by device **100** in response to detection of activation **338** of key **336** depends on the duration of activation **338**. If activation **338** is determined to last less than a second predefined time period (e.g., 0.2, 0.3, 0.4, 0.5 seconds or any reasonable time), a single instance of character "-" **339** is entered into input text **302**, as shown in FIG. **3**M. If activation **338** is determined to last more than the second predefined time period, multiple instances of character "-" **339** are entered into input text **302**, as shown in FIG. **3**N, until activation **338** of key **336** ceases.

FIG. **3**O illustrates additional options icon **316**, in character selection area **310**, having current character focus **314**. As described above with reference to FIG. **3**C, current character focus **314** may be moved within character selection area **310** by activating arrow keys **318** or **320**. Thus, arrow keys **318** or **320** may be activated one or more times to move current character focus **314** onto additional options icon **316**. When additional options icon **316** has the current character focus **314**, additional options icon **316** may be activated by activating a key (e.g., space key **340**) on physical keyboard **114**. For example, FIG. **3**O illustrates activation **341** of space key **340**. In some embodiments, additional options icon **316** may also

be activated by positioning cursor **334** (e.g., using mouse **116** or trackpad **118**) over additional options icon **316** and activating cursor **334** when in position.

In response to the activation of additional options icon **316**, expanded character selection area **342** is displayed. Expanded character selection area **342** is displayed in text entry area **300** in place of character selection area **310**. Expanded character selection area **342** includes a larger set of candidate characters **312**; candidate characters **312** displayed in expanded character selection area **342** include the candidate characters that were displayed in character selection area **310** as well as additional candidate characters (e.g., additional alternate characters corresponding to key **306**). Entry of a candidate character **312** from expanded character selection area **342** may be achieved by the ways described above (e.g., activating key **306** while the desired candidate character has the current character focus **314**, activating cursor **334** while in position, etc.). In some embodiments, expanded character selection area **342** includes characters that do not correspond to key **306**, such as symbol characters (e.g., #, %, &, Δ, and/or π) or special characters (e.g., ©, ®, ™, §, and/or ¶).

FIGS. **4A-4D** are flow diagrams illustrating a method **400** of entering alternate characters using a physical keyboard in accordance with some embodiments. The method **400** is performed at an electronic device (e.g., device **100**, FIG. **1**) with a display and a physical keyboard (e.g., a notebook computer or a desktop computer). Some operations in method **400** may be combined and/or the order of some operations may be changed.

As described below, the method **400** provides a faster, more efficient way to enter alternate characters using a physical keyboard. The method reduces the cognitive burden on a user when entering alternate characters using a physical keyboard, thereby creating a more efficient human-machine interface. For battery-operated electronic devices, enabling a user to enter alternate characters using a physical keyboard faster and more efficiently conserves power and increases the time between battery charges.

The device displays a text entry area with an insertion point on a display of the device (**402**). In FIG. **3A**, for example, text entry area **300**, with insertion point **304**, is displayed on display **112** of device **100**.

The device detects activation of a first physical key in a physical keyboard of the device (e.g., detecting depression of the first physical key by a finger pressing down on the first physical key) (**404**). For example, in FIG. **3A**, activation **308** of key **306** in physical keyboard **114** is detected.

In response to a determination that the activation of the first physical key lasts less than a first predefined time period, the device enters a single instance of a default character that corresponds to the first physical key in the text entry area (e.g., at the insertion point in the text entry area) (**406**). For example, in FIGS. **3A-3B**, if the duration of activation **308** is less than a predefined amount of time (i.e., if device **100** determines that activation **308** lasts less than the predefined amount of time), a single instance of character "a" **305**, which is the default character corresponding to key **306**, is entered into input text **302** at the position indicated by insertion point **304**.

In response to a determination that the activation of the first physical key lasts more than the first predefined time period, the device displays a character selection area on the display (**408**). The character selection area includes the default character and a plurality of alternate characters that correspond to the first physical key. The device displays the character selection area without entering a character in the text entry area.

For example, in FIGS. **3A** and **3C**, if the duration of activation **308** is more than a predefined amount of time (i.e., if device **100** determines that activation **308** lasts more than the predefined amount of time), character selection area **310** is displayed. Character selection area **310** includes, as candidate characters **312**, the default character "a," corresponding to key **306**, and multiple alternates characters that are variants of "a" and which also correspond to key **306**.

In some embodiments, the character selection area **310** is displayed next to the insertion point, which reduces the eye movement by the user needed to read the characters in the character selection area.

In some embodiments, the alternate characters displayed in the character selection area are based on a usage history of a user of the device (**410**). For example, within character selection area **312**, the alternate characters among the candidate characters **312** may be selected for display by device **100** based on their frequency of usage by the user of device **100**.

In some embodiments, the alternate characters displayed in the character selection area are user configurable (**412**). For example, the user may configure the language or keyboard mapping for physical keyboard **114**. The alternate characters that are displayed as candidate characters **312** may be based on the language or keyboard mapping setting.

In some embodiments, the alternate characters displayed in the character selection area are based on the physical keyboard (**414**). For example, different physical keyboards are associated with different languages or keyboard mappings by default (e.g., a Russian keyboard, an English keyboard (e.g., a QWERTY keyboard), etc.). The alternate characters that are displayed as candidate characters **312** may be based on the language or keyboard mapping associated with the physical keyboard **114** in use. The alternate characters corresponding to the keys of a physical keyboard may be fixed by the type of physical keyboard or may be user configurable.

While displaying the character selection area, the device detects activation of a second physical key in the physical keyboard (**416**). For example, in FIG. **3C**, while character selection area **310** is displayed, activation **322** of key **318** is detected (in which case the second physical key is different from the first physical key). As another example, in FIG. **3D**, activation **324** of key **306** is detected (in which case the second physical key is the same as the first physical key).

In response to a determination that the activated second physical key is an arrow key, the device moves a current character focus in the character selection area in accordance with a direction of the arrow key (**418**). For example, in FIG. **3C**, right arrow key **318** is activated **322**. In response to a determination that the activated key is the right arrow key **318**, current character focus **314** is moved from the character "a" (FIG. **3C**) to the character "à" within character selection area **310** (FIG. **3D**).

In response to a determination that the activated second physical key is the first physical key (**420**), the device enters in the text entry area (e.g., at the insertion point in the text entry area) a single instance of a character that has the current character focus in the character selection area (**422**), and ceases to display the character selection area (**424**). For example, in FIG. **3D**, key **306** is activated **324** a second time, subsequent to activation **308** (FIG. **3A**). In response to a determination that activation **324** activated key **306**, the character "à" **317**, which has the current character focus **314** in FIG. **3D**, is entered into input text **302** in FIG. **3E**. Also, in response to the determination that the activated second physical key is the first physical key, character selection **310** ceases to be displayed in FIG. **3E**.

In some embodiments, in response to a determination that the activated second physical key is a physical key for entering characters other than the first physical key (**426**), the device enters in the text entry area (e.g., at the insertion point in the text entry area) a single instance of a character that has the current character focus in the character selection area followed by a single instance of a default character that corresponds to the second physical key (**428**), and ceases to display the character selection area (**430**). For example, in FIG. **3**F, which follows from FIG. **3**C, key **326** is activated **327**. Key **326**, a different key from key **306**, corresponds to the character "c." In FIG. **3**G, in response to the activation **327** of key **326**, a character "a," which had the current character focus **314** in FIG. **3**F, and a character "c" are entered into input text **302**. Also, character selection area **310** ceases to be displayed, as shown in FIG. **3**G.

In some embodiments, a respective character in the character selection area is displayed with a corresponding number adjacent to the respective character (**432**). For example, in FIG. **3**H, each candidate character **312** in character selection area **310** is displayed with a respective corresponding number **328** adjacent to the character.

In response to a determination that the activated second physical key is a number key with the corresponding number (**434**), the device enters in the text entry area (e.g., at the insertion point in the text entry area) a single instance of the respective character that corresponds to the number (**436**), and ceases to display the character selection area (**438**). For example, in FIG. **3**H, numbers 1-7 correspond to default character "a" and alternate characters "à," "á," "â," "ã," "ä," and "æ," respectively. In response to activation of the "1" key, the default character "a" is entered. In response to activation of the "2" key, the alternate character "à," is entered. In response to activation of the "3" key, the alternate character "á," is entered. And so on. In FIG. **3**H, for example, key **330**, corresponding to the number "6," is activated **332**. In character selection area **310**, the number "6" corresponds to the alternate character "ä." In response to a determination that key **330** is activated, the character "ä" is entered into input text **302** and character selection area **310** ceases to be displayed, as shown in FIG. **3**I.

In some embodiments, the device places a cursor over a character in the character selection area (**440**) and detects activation of the cursor while the cursor is over the character in the character selection area (e.g., detecting a mouse click or touch pad click while the cursor is over the character) (**442**). The cursor may be placed over the character in response to user input (e.g., the user positioning the cursor using a mouse or touchpad).

In response to detecting activation of the cursor while the cursor is over the character in the character selection area (**444**), the device enters in the text entry area (e.g., at the insertion point in the text entry area) a single instance of the character that the cursor is over (**446**), and ceases to display the character selection area (**448**). For example, in FIGS. **3**J-**3**K, in response to detecting activation of cursor **334** while cursor **334** is positioned over the character "ä" in character selection area **310**, the character "ä" is entered into input text **302** and character selection area **310** ceases to be displayed.

In some embodiments, the first physical key is a letter key (**450**), and while the character selection area is not displayed, the device detects activation of a third physical key in the physical keyboard, the third physical key being a non-letter key (e.g., a punctuation key or a symbol key) (**452**). For example, the originally activated key **306** is a letter key (corresponding to "a"), and in FIG. **3**L, activated **338** of non-letter key **336** (corresponding to "-") is detected.

In response to a determination that the activation of the third physical key is less than a second predefined time period, the device enters a single instance of a character that corresponds to the third physical key in the text entry area (e.g., at the insertion point in the text entry area) (**454**). For example, in response to a determination that that the duration of activation **338** of key **336** is less than the second predefined time period, a single instance of "-" is entered into input text **302**, as shown in FIG. **3**M. In some embodiments, the second predefined time period is the same as the first predefined time period. In some embodiments, the second predefined time period is longer than the first predefined time period. In some embodiments, the second predefined time period is shorter than the first predefined time period.

In response to a determination that the activation of the third physical key is greater than the second predefined time period, the device enters multiple instances of the character that corresponds to the third physical key in the text entry area (e.g., at the insertion point in the text entry area) (**456**). For example, if a user holds down the period key for more than a predefined time (e.g., 0.2, 0.3, 0.4, 0.5 seconds or any reasonable time) then multiple periods (".") will be entered until activation of the period key ceases. Thus, in some embodiments, activating a letter key for more than a predefined time results in display of a character selection area for that letter key, whereas activating a non-letter key for more than a predefined time results in repeated entry of the character that corresponds to the non-letter key. For example, in response to a determination that the duration of activation **338** of key **336** is more than the second predefined time period, multiple instance of "-" is entered into input text **302**, as shown in FIG. **3**N.

In some embodiments, the character selection area includes an additional options icon (**458**), and in response to detecting activation of the additional options icon (e.g., by detecting a mouse click or touch pad click while the cursor is over the additional options icon or by detecting activation of a physical key while the current character focus is on the additional options icon), the device displays a user interface with additional alternate characters (**460**). For example, in FIG. **3**O, character selection area **310** includes additional options icon **316**. In response to the detection of activation **341** of key **340** while additional options icon **316** has the current character focus **314**, expanded character selection area **342**, with additional candidate characters **312** (e.g., more alternate characters), is displayed, as shown in FIG. **3**P.

In accordance with some embodiments, FIG. **5** shows a functional block diagram of an electronic device **500** configured in accordance with the principles of the invention as described above. The functional blocks of the device may be implemented by hardware, software, or a combination of hardware and software to carry out the principles of the invention. It is understood by persons of skill in the art that the functional blocks described in FIG. **5** may be combined or separated into sub-blocks to implement the principles of the invention as described above. Therefore, the description herein may support any possible combination or separation or further definition of the functional blocks described herein.

As shown in FIG. **5**, an electronic device **500** includes a display unit **502** configured to display a text entry area with an insertion point, a physical keyboard unit **504** configured to receive activations of physical keys in the physical keyboard unit **504**, and a processing unit **506** coupled to the display unit **502** and the physical keyboard unit **504**. In some embodiments, the processing unit **506** includes a detecting unit **508**, an entering unit **510**, a display enabling unit **512**, a moving unit **514**, a ceasing unit **516**, and a placing unit **518**.

The processing unit **506** is configured to: detect activation of a first physical key in the physical keyboard unit (e.g., with the detecting unit **508**); in response to a determination that the activation of the first physical key lasts less than a first predefined time period, enter a single instance of a default character that corresponds to the first physical key in the text entry area (e.g., with the entering unit **510**); in response to a determination that the activation of the first physical key lasts more than the first predefined time period, enable display of a character selection area on the display unit (e.g., with the display enabling unit **512**), the character selection area including the default character and a plurality of alternate characters that correspond to the first physical key; while displaying the character selection area, detect activation of a second physical key in the physical keyboard unit (e.g., with the detecting unit **508**); in response to a determination that the activated second physical key is an arrow key, move a current character focus in the character selection area in accordance with a direction of the arrow key (e.g., with the moving unit **514**); and in response to a determination that the activated second physical key is the first physical key: enter in the text entry area a single instance of a character that has the current character focus in the character selection area (e.g., with the entering unit **510**), and cease to display the character selection area (e.g., with the ceasing unit **516**).

In some embodiments, the alternate characters displayed in the character selection area are based on a usage history of a user of the device.

In some embodiments, the alternate characters displayed in the character selection area are user configurable.

In some embodiments, the alternate characters displayed in the character selection area are based on the physical keyboard.

In some embodiments, the processing unit **506** is configured to, in response to a determination that the activated second physical key is a physical key for entering characters other than the first physical key: enter in the text entry area a single instance of a character that has the current character focus in the character selection area followed by a single instance of a default character that corresponds to the second physical key (e.g., with the entering unit **510**), and cease to display the character selection area (e.g., with the ceasing unit **516**).

In some embodiments, a respective character in the character selection area is displayed with a corresponding number adjacent to the respective character, and the processing unit **506** is configured to, in response to a determination that the activated second physical key is a number key with the corresponding number: enter in the text entry area a single instance of the respective character that corresponds to the number (e.g., with the entering unit **510**), and cease to display the character selection area (e.g., with the ceasing unit **516**).

In some embodiments, the processing unit **506** is configured to: place a cursor over a character in the character selection area (e.g., with the placing unit **518**); detect activation of the cursor while the cursor is over the character in the character selection area (e.g., with the detecting unit **508**); and, in response to detecting activation of the cursor while the cursor is over the character in the character selection area: enter in the text entry area a single instance of the character that the cursor is over (e.g., with the entering unit **510**), and cease to display the character selection area (e.g., with the ceasing unit **516**).

In some embodiments, the first physical key is a letter key, and the processing unit **506** is configured to, while the character selection area is not displayed, detect activation of a third physical key in the physical keyboard unit, the third physical key being a non-letter key (e.g., with the detecting unit **508**); in response to a determination that the activation of the third physical key is less than a second predefined time period, enter a single instance of a character that corresponds to the third physical key in the text entry area (e.g., with the entering unit **510**); and in response to a determination that the activation of the third physical key is greater than the second predefined time period, enter multiple instances of the character that corresponds to the third physical key in the text entry area (e.g., with the entering unit **510**).

In some embodiments, the character selection area includes an additional options icon, and the processing unit **506** is configured to, in response to detecting activation of the additional options icon, enable display of a user interface with additional alternate characters (e.g., with the display enabling unit **512**).

In some embodiments, non-letter alternate characters may be entered in an analogous manner as alternate letter characters are entered as described above. For example, activating the key corresponding to the dollar sign for longer than a predefined time period may activate display of a character selection area where the candidate characters are the dollar sign and symbols corresponding to other currencies. As further examples, quotation marks from different languages and emoji characters may also be entered in an analogous manner.

In some embodiments, movement of the current character focus in the character selection area is achieved by activating the originally activated character key repeatedly, rather than or in addition to activating the arrow keys. For example, in FIG. **3**C, key **306** may be activated repeatedly to cycle through candidate characters **312**. To enter a desired candidate character, the user activates a character key other than key **306** (e.g., the space bar, a different letter key, a punctuation key).

As described above, when the first physical key is activated and the activation lasts longer than the first predefined time period, a character selection area is displayed. In some embodiments, the user may configure the action taken, when the activation lasts longer than the first predefined time period, to be entry of multiple instances of the corresponding character instead of displaying the character selection area. In other words, the user may configure to device to, when the activation lasts more than a predefined time period, to display the character selection area or to enter the character repeatedly.

The operations in the information processing methods described above may be implemented by running one or more functional modules in information processing apparatus such as general purpose processors or application specific chips. These modules, combinations of these modules, and/or their combination with general hardware (e.g., as described above with respect to FIG. **1**) are all included within the scope of protection of the invention.

The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated.

What is claimed is:

1. An electronic device, comprising:

a display;

a keyboard;

one or more processors;

a memory; and

one or more programs, wherein the one or more programs are stored in the memory and are configured to be executed by the one or more processors, the one or more programs including instructions for:

displaying a text entry area with an insertion point on the display;

detecting activation of a first key on the keyboard;

in response to a determination that the activation of the first key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first key in the text entry area;

in response to a determination that the activation of the first key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first key;

while displaying the character selection area, detecting activation of a second key on the keyboard;

in response to a determination that the activated second key is a key for navigation, moving a current character focus in the character selection area in accordance with a direction of the key for navigation; and

in response to a determination that the activated second key is the first key, entering in the text entry area a single instance of a character that has the current character focus in the character selection area, and ceasing to display the character selection area.

2. The device of claim 1, wherein the alternate characters displayed in the character selection area are based on a usage history of a user of the device.

3. The device of claim 1, wherein the alternate characters displayed in the character selection area are user configurable.

4. The device of claim 1, wherein the alternate characters displayed in the character selection area are based on the keyboard.

5. The device of claim 1, including instructions for:

in response to a determination that the activated second key is a key for entering characters other than the first key, entering in the text entry area a single instance of a character that has the current character focus in the character selection area followed by a single instance of a default character that corresponds to the second key, and ceasing to display the character selection area.

6. The device of claim 1, wherein a respective character in the character selection area is displayed with a corresponding number adjacent to the respective character, the device including instructions for:

in response to a determination that the activated second key is a number key with the corresponding number, entering in the text entry area a single instance of the respective character that corresponds to the number, and ceasing to display the character selection area.

7. The device of claim 1, including instructions for:

placing a cursor over a character in the character selection area;

detecting activation of the cursor while the cursor is over the character in the character selection area; and,

in response to detecting activation of the cursor while the cursor is over the character in the character selection area, entering in the text entry area a single instance of the character that the cursor is over, and ceasing to display the character selection area.

8. The device of claim 1, wherein the first key is a letter key, the device including instructions for:

while the character selection area is not displayed, detecting activation of a third key on the keyboard, the third key being a non-letter key;

in response to a determination that the activation of the third key is less than a second predefined time period, entering a single instance of a character that corresponds to the third key in the text entry area; and

in response to a determination that the activation of the third key is greater than the second predefined time period, entering multiple instances of the character that corresponds to the third key in the text entry area.

9. The device of claim 1, wherein the character selection area includes an additional options icon, the device including instructions for: in response to detecting activation of the additional options icon, displaying a user interface with additional alternate characters.

10. The device of claim 1, wherein the keyboard is a keyboard.

11. A method, comprising:

at an electronic device with a display and a keyboard:

displaying a text entry area with an insertion point on the display;

detecting activation of a first key in the keyboard;

in response to a determination that the activation of the first key lasts less than a first predefined time period, entering a single instance of a default character that corresponds to the first key in the text entry area;

in response to a determination that the activation of the first key lasts more than the first predefined time period, displaying a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first key;

while displaying the character selection area, detecting activation of a second key in the keyboard;

in response to a determination that the activated second key is an arrow key, moving a current character focus in the character selection area in accordance with a direction of the arrow key; and

in response to a determination that the activated second key is the first key, entering in the text entry area a single instance of a character that has the current character focus in the character selection area, and ceasing to display the character selection area.

12. The method of claim 11, wherein the plurality of alternate characters are based on a usage history.

13. The method of claim 11, wherein the plurality of alternate characters are selectable based on received input.

14. The method of claim 11, wherein the plurality of alternate characters displayed are based on the keyboard.

15. A non-transitory computer readable storage medium storing one or more programs, the one or more programs comprising instructions, which when executed by an electronic device with a display and a keyboard, cause the device to:

display a text entry area with an insertion point on the display;

detect activation of a first key in the keyboard;

in response to a determination that the activation of the first key lasts less than a first predefined time period, enter a single instance of a default character that corresponds to the first key in the text entry area;

in response to a determination that the activation of the first key lasts more than the first predefined time period, display a character selection area on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first key;

while displaying the character selection area, detect activation of a second key in the keyboard;

in response to a determination that the activated second key is an arrow key, move a current character focus in the character selection area in accordance with a direction of the arrow key; and

in response to a determination that the activated second key is the first key, enter in the text entry area a single instance of a character that has the current character focus in the character selection area, and cease to display the character selection area.

16. A graphical user interface on an electronic device with a display, a keyboard, a memory, and one or more processors to execute one or more programs stored in the memory, the graphical user interface comprising:

a text entry area with an insertion point;

wherein: in response to a determination that an activation of a first key in the keyboard lasts less than a first predefined time period, a single instance of a default character that corresponds to the first key is entered in the text entry area;

in response to a determination that the activation of the first key lasts more than the first predefined time period, a character selection area is displayed on the display, the character selection area including the default character and a plurality of alternate characters that correspond to the first key;

while displaying the character selection area, activation of a second key in the keyboard is detected;

in response to a determination that a second key in the keyboard, activated while the character selection area is displayed, is an arrow key, a current character focus in the character selection area is moved in accordance with a direction of the arrow key; and

in response to a determination that the activated second key is the first key, a single instance of a character that has the current character focus in the character selection area is entered in the text entry area, and the character selection area ceases to be displayed.

17. The graphical user interface of claim **16**, wherein the plurality of alternate characters are based on a usage history.

18. The graphical user interface of claim **16**, wherein the plurality of alternate characters are configurable.

19. The graphical user interface of claim **16**, wherein the plurality of alternate characters displayed are based on the keyboard.

20. The graphical user interface of claim **16**, wherein the keyboard is a keyboard.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,922,490 B2
APPLICATION NO. : 13/243733
DATED : December 30, 2014
INVENTOR(S) : Douglas R. Davidson et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Claim 10, Column 22, line 22 should read as follows:

10. The device of claim 1, wherein the keyboard is a --physical-- keyboard.

Claim 20, Column 24, line 25 should read as follows:

20. The graphical user interface of claim 16, wherein the keyboard is a --physical-- keyboard.

Signed and Sealed this
Fourteenth Day of April, 2015

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office